PROPOSED

LINCOLN SERVICE DISTRICT

MULTNOMAH COUNTY, OREGON

ENGINEER'S REPORT

SANITARY SEWER SYSTEM

AUGUST 1967

JOHN W. CUNNINGHAM & ASSOCIATES
Consulting Engineers
OREGON BANK BLDG. PORTLAND, OREGON 97204

774

WPC-ORE-247-R

PORTLAND

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
Division of Construction Grants
Analysis Branch

PROJECT DESIGN DATA

Project No.: WPC-ORE-249 Date Plans & Specs. Approved: NOV 4, 1968

Location: PORTLAND, OREGON Discharged to: COLUMBIA RIVER

Scope of Project: INTERCEPTORS, LIFT STATIONS & FORCE MAINS

Degree of Treatment Available: (at present) PRIMARY BOD Removal = 25-35 %
Degree of Treatment Provided: (after project) PRIMARY BOD Removal = 25-35 %
This Project Related or Tandem to Previous Project(s): WPC-212,

Description of New or Modified Plant: EXISTING S.T.P. PROVIDES PRIMARY TREATMENT ONLY. P & S NOW BEING PREPARED FOR EXPANSION TO SECONDARY TREATMENT.

PROJECT LOADING

Parameters	Present Conditions (Before Project)	After Project (Initially)	In Design Year(19)
1. Industrial Wastes - mgd		.75	1.50
2. Industrial Wastes - BOD ppm			
3. Industrial Wastes BOD lb/day			
4. Industrial Wastes - P.E.*		—	—
5. Domestic Population Served		—	—
6. Domestic Average Flow - mgd		[illegible]	1.56
7. Total Average Flow - mgd (Items 1 + 6)		1.07	3.06
8. Raw P.E. (Before Treatment) (Items 4 + 5)			
9. Effluent P.E. (After Treatment) (Item 8 minus (Item 8 x % BOD Removal))			

☑ INTERCEPTOR or ☑ FORCE MAIN		OUTFALL	
Lineal Feet	Size Pipe	Lineal Feet	Size Pipe
10,085 —	10" & 10 18" & INT		
165' —	4" Ø F.M.		
2220' —	14" Ø F.M.		
Flow Capacity 44	mgd MAX.	Flow Capacity	m

LIFT STATION

Capacity - mgd	Capacity - mgd
1. # 1 ≈ 1.5 MGD	3.
2. # 2 ≈ 3-2A MGD	4.

*PE = Total lb BOD/day / 0.17

CY. SENT WASH. D. C.

ENGINEER'S REPORT

SANITARY SEWER SYSTEM

for

RIVERGATE SERVICE DISTRICT

MULTNOMAH COUNTY, OREGON

Prepared for:

BOARD OF COUNTY COMMISSIONERS
MULTNOMAH COUNTY, OREGON

M. James Gleason, Chairman

L. W. Aylsworth, Commissioner,

David Eccles, Commissioner

Dan Mosee, Commissioner

Mel Gordon, Commissioner

Paul C. Northrop, Director, Department of Public Works

J. R. Kalinoski, Chief Deputy Director, Department of Public Works

John W. Cunningham & Associates, Consulting Engineers
Portland, Oregon

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PURPOSES OF THIS REPORT

The several firms occupying the former Oregon Shipbuilding Corp. site and the portion of Rivergate Industrial District in which dredged fill has been completed have been directed by the Oregon State Sanitary Authority to cease the discharge of untreated sewage and waste products into the Willamette River or to show evidence of progress toward this end not later than September 1, 1967. Although septic tanks are in use by some of the occupants of the area, disposal of septic tank effluent is impaired whenever the river level is high. By direction of the Multnomah County Sanitarian, no additional septic tanks may be constructed in the area and it is understood that permission to operate the septic tanks now in use has been given on a temporary basis; revocable when sanitary sewers are constructed. For these reasons, the necessity for sanitary sewers to serve the area is not in question.

To serve the area abutting North Rivergate Blvd., The Port of Portland has considered constructing some 2,100 feet of gravity sewer with either a small package type treatment plant discharging into the Willamette or a sewage pumping station with approximately 9,200 feet of pressure sewer to reach Portland's St Johns Interceptor Sewer on North Lombard St. Either of these plans involves a greater expense to The Port of Portland in combined initial and operating cost than a connection to a sewer system required to serve the former shipyard area.

The separate treatment of sewage is not discussed hereinafter for the following reasons:

1. The cost for building approximately 2,800 feet of pressure sewer from a pumping station near the Beall gate to the St John Interceptor on North Lombard St. will be less than the cost of a sewage treatment plant of like capacity and its outfall to the Willamette.

2. Pumping or lifting of sewage is required in any event.

3. Conveyance and treatment charges by Portland are expected to be less than the operation and maintenance costs for a small "complete" treatment plant.

4. The Oregon State Sanitary Authority and the Multnomah County Sanitarian have indicated that they will not willingly approve construction of a separate treatment plant for the proposed service district because of the proximity of the St Johns Interceptor.

5. The requirements for operation and maintenance of treatment plant could be bothersome to the proposed service district and to the County; and the presence of such a plant might be objectionable to the occupants in the immediate vicinity of the plant.

Eliminating the need for further discussion of the necessity for sewers and an alternate plan involving separate sewage treatment, the purposes of this report are as follows:

1. To investigate such remaining sewers as can be found on the site and identified on available plans for the Oregon Shipbuilding Corp. and to determine if these facilities can be put to use economically.

2. To locate and identify sewer outlets from the building which are in use.

3. To provide a preliminary map showing the sizes and location of proposed sewers, manholes, pumping stations, and force mains or pressure sewers.

4. To provide estimates of the costs of construction, operation and maintenance of the system.

5. To suggest means for financing the project and for distributing costs between Rivergate and the former shipyard areas.

DESCRIPTION OF PROPOSED RIVERGATE SERVICE DISTRICT

Area Involved

The areas to be considerrd for inclusion within the proposed service district consist of the former Oregon Shipbuilding Corp. site, which is essentially the same as is contained in Fire District No. 26, and the filled portion of the Rivergate Industrial District. The former Shipbuilding Corp. site is bounded on the south by Terminal No. 4, on the east by North Lombard Street and its extension, on the north by the Bonneville Power Administration right of way, and on the west by the river. The approximate area of the former Shipbuilding Corp. site is 330 acres. The filled portion of the Rivergate Industrial District, currently prepared for industrial occupancy, extends east from the Willamette for approximately 3,200 feet to a dike and from the Bonneville Power Administration right of way, approximately 4,500 feet toward the north. This portion of the Rivergate property represents an area of some 325 acres.

Land Use and Occupancy

Of the original shipyard and housing area, more than half is vacant. Currently, the major occupants consist of the Time Oil Co. tank farm and depot in the northwest corner; Container Corporation of America's plant in the west central area to the north of the former outfitting basin; and the Beall Pipe and Tank Corporation plant and offices in the southwesterly part of the site. Adjacent to the Beall office building are the offices of Dulien Steel Co. and McIntyre Electric Co. Between the Beall fabricating plant and the Willamette River is the former shipyard plate shop, which is currently occupied by a transfer and storage firm and a steel fabricator.

At the present time, the Rivergate area is occupied by plants of the Jan Cleere Lime Co. and Consolidated Rubber Inc., with a development by Oregon Steel Mills planned for the near future.

Both the former shipyard area and Rivergate are well situated for industrial purposes, with rail, water and arterial road transportation at hand. The Rivergate Industrial District, of which the portion to be served by the proposed sewer is only a fraction, is being developed by The Port of Portland as a major industrial complex, ultimately to be filled above anticipated flood level and provided with all necessary utilities. The future industrial development and occupancy of both areas seems assured.

Location and Description

The McIntyre, Beall and Dulien office buildings and the Beall fabricating plant are served by four and six inch cast iron sewers which drain to a pump sump adjacent to the main gate of the Beall plant. At this point the sewage is lifted to a six inch cast iron and eight inch concrete gravity sewer which connects to a ten inch concrete sewer line at the east end of the outfitting basin. This ten inch sewer discharges into a fifteen inch concrete sewer line which follows the north bank of the outfitting basin and picks up four connections from the Container Corporation of America plant before discharging into the Willamette River.

The office building on the east side of the Beall fabricating plant, the Time Oil Co. depot, the Ash Grove Lime Co. plant and Consolidated Metco are currently served by septic tanks. Concrete gravity sewers from the former mold loft and plate shop discharge into the Willamette River through a fifteen inch concrete and steel outfall sewer which is located between ways No. 7 and No. 8.

Present Condition and Usefulness

The existing sewer system was constructed more than 25 years ago and a preliminary examination indicates that, with the exception of the cast iron iron portions, the condition of the existing sewers does not warrant consideration for use in any future system. This is particularly true of the line on the north bank of the outfitting basin, which was inspected on July 30, 1967. The four manholes examined were constructed of clay brick, with concrete collars containing the cover ring. Only one of the four was still intact. Of the other three, one had its ring displaced and the manhole was apparently

filled with sand and rocks; the other two were broken off at the top of the brick, and one of the collars was missing completely. All were partly filled with sludge, rags, paper and other debris. In addition, the location is subject to flooding by annual winter and spring floods of the Willamette and Columbia Rivers.

Since these sewers have cement mortar joints and were designed to discharge into the Willamette River, excessive infiltration of ground water and river water can be assumed.

Basis for Design

The anticipated volumes of sanitary sewage are as follows:

	Average	Peak
Initial flow at project completion	15 g.p.m.	45 g.p.m.
Flow when all land is occupied	40 g.p.m.	120 g.p.m.
Ultimate flow for high employee density	200 g.p.m.	400 to 600 g.p.m.

All projected sewers have been designed with pipe sizes and slopes to give velocities of more than two feet per second, based on the Kutter formula with n = 0.013. The pipe sizes required to permit flat grades with reasonable depth of excavation can carry at least twice the ultimate flows anticipated.

Description

The approximate routes of sewers and sizes of pipe are shown on the map included with report. Sewers within the Rivergate area can follow either the arrangement suggested in the report dated May 1966, by Stevens, Thompson, Runyan & Ries, Inc., or the arrangement suggested herein.

The sewers suggested in the May 1966 report consist of 2,200 feet of eight inch pipe laid at minimum grade (4 feet per thousand feet) to a pumping station located near the north property line of the Consolidated Mateo plant. Two 100 gallon per minute pumps operating alternately would discharge sewage through 9,860 feet of four inch diameter force main to the St Johns Interceptor on North Lombard Street.

The plan included with this report shows a modified version of the same sewer arrangement to serve the Rivergate area. The sewer has been extended further toward the north and has been lowered so that any point within the filled area indicated on the plan may be reached by 8 inch branch sewers laid at minimum grade. The grade of the main sewer located on

[illegible] has been increased to provide higher velocity and to lessen maintenance. The pumping station, containing two 200 g.p.m. pumps which will operate alternately, will transfer sewage through 2,600 feet of six inch diameter force main to the most northerly manhole of the sewer system in the shipyard area.

The sewers within the shipyard area, beginning opposite the Time Oil Co. plant, will convey sewage by gravity toward the south and east and will terminate at a new sewage pumping station which will be located adjacent to and will replace the existing lift station. With the exceptions of approximately 500 feet of eight inch sewer located east of the Time Oil Co. and a 1,000 foot long eight inch lateral sewer paralleling the south side of the Container Corporation building, all main sewers within the shipyard area will be twelve inch diameter pipe. Sewer depth will permit future construction of eight inch lateral sewers to serve all portions of the area and sewer grades will provide sufficient velocity to minimize maintenance and deposition of solids. Sewage flow now entering the old pump station from existing cast iron sewer lines will be diverted to the new pumping station.

The combined sewage flow received at the new pumping station will be lifted through a six inch diameter cast iron force main to the St Johns Interceptor on North Lombard Street. This force main would be located in front of the Dulien, Beall and McIntyre buildings; then would follow the toe of the road slope in a southerly direction to the access road embankment. The force main would cross the access roads, including the road to Terminal No. 4; would be suspended from the Lombard St. railroad overpass; and would then parallel North Lombard Street to a connection to the St Johns Interceptor.

FACILITIES IN RIVERGATE AREA

Pumping Station and Force Main

Package pump station, complete	Lump sum		$11,000.	
Excavation & backfill (force main)	775 cu. yd.	@ $ 2.00	1,550.	
6" Cast iron pipe, furnish & lay	2,600 feet	@ 3.50	9,100.	
Road & railroad crossings	Lump sum		1,500.	
Subtotal:				$23.150.
Contingencies, engineering, etc. 20%				4,650.
Total:				$27,800

Gravity Sewers

Excavation and backfill	3,100 cu. yd.	@ $ 3.00	$ 9,300.	
Paving, cut and replace	50 sq. yd.	@ 5.00	250.	
8" Concrete sewer, furnish & lay	3,200 feet	@ 2.40	7,680.	
Manholes	9 each	@ 385.00	3,465.	
Connections	3 each	@ 250.00	750.	
Subtotal				$21,445.
Contingencies, engineering, etc. 20%				4,255.
Total:				$25,700.
Estimated Construction Cost for Facilities in Rivergate Area				$53,500.

FACILITIES IN SHIPYARD AREA

Pumping Station and Force Main

Package pump station, complete	Lump sum		$12,000.	
Cut over old C.I. sewers	Lump sum		2,000.	
Excavation & backfill (force main)	850 cu. yd.	@ $ 3.00	2,550.	
Paving, cut and replace	150 sq. yd.	@ 5.00	750.	
6" Cast iron pipe, furnish & lay	2,800 feet	@ 3.50	9,800.	
Road and bridge crossings	Lump sum		3,000.	
Connection to interceptor	Lump sum		500.	
Subtotal:				$30,600.
Contingencies, engineering, etc. 20%				6,100.
Total:				$36,700.

Gravity Sewer from Pumping Station to Container Corp. Branch

Excavation and backfill	1,550 cu. yd.	@ $ 3.00	$ 4,650.	
Pavement, cut and replace	400 sq. yd.	@ 5.00	2,000.	
Bedding materials	lump sum		400.	
12" Concrete sewer, furnish & lay	1,300 feet	@ 4.00	5,200.	
Manholes	5 each	@ 430.00	2,150.	
Subtotal:				$14,400.
Contingencies, engineering, etc. 20%				2,900.
Total:				$17,300.

Gravity Sewer from Container Corp. Branch to North Extremity

Excavation and backfill	2,150 cu. yd.	@ $ 3.00	$ 6,450.	
Pavement, cut and replace	150 sq. yd.	@ 5.00	750.	
Bedding materials	lump sum		600.	
12" Concrete sewer, furnish & lay	2,000 feet	@ 4.00	8,000.	
8" Concrete sewer, furnish & lay	500 feet	@ 2.40	1,200.	
Manholes	6 each	@ 407.00	2,442.	
Wyes	6 each	@ 10.00	60.	
Subtotal:				$19,502.
Contingencies, engineering, etc. 20%				3,898.
Total:				$23,400.

Branch Sewer Serving Container Corp.

Excavation and backfill	730 cu. yd.	@ $ 3.50	$ 2,550.	
Pavement, cut and replace	330 sq. yd.	@ 5.00	1,650.	
8" Concrete sewer, furnish & lay	1,000 feet	@ 2.40	2,400.	
Manholes	2 each	@ 300.00	600.	
Connections to plant sewers	4 each	@ 75.00	300.	
Subtotal:				$ 7,500.
Contingencies, engineering, etc. 20%				1,500.
Total:				$ 9,000.

Estimated Construction Cost of Facilities in Shipyard Area $86,400.

OPERATION AND MAINTENANCE COSTS

Power Cost

Since the average sewage volume will be very low when the system is first placed in operation, power costs for pumping have been based on sewage volumes which may be anticipated after the area which can be served is fully occupied by industries having an employee density similar to that of the present tenants. Based on average sewage flows of 20 gallons per minute for the Rivergate area and 40 gallons per minute for the two areas combined, and on the cost of electric power at one cent per K.W.H., the approximate power costs would be as follows:

Rivergate pumping station	$ 19.80 per year
Beallgate station, pumping sewage from both areas	$120.00 per year

These amounts include 20% contingency allowance.

Maintenance

If the proposed sewers and pumping stations are constructed by a County Service District organization, the maintenance and operation of all facilities will be performed by County personnel. The time required for maintenance, periodic inspection and incidental repairs is estimated as averaging 8 hours per week, equally divided between the two areas. The annual labor cost at $4.50 per hour would be $1,870., or $935 for each area. Materials and supplies would be a minor item, totaling perhaps $100 per year.

Conveyance and Treatment Charges

In return for the use of City facilities, Portland will require payment of conveyance and treatment charges consisting of a fee, payable

annually or monthly, toward operation and maintenance of City facilities and a fixed charge which represents a share of the capital cost of the interceptor sewer and sewage treatment plant. Calculation of these charges will be made by the City Department of Public Works following indication that a sanitary district will be formed and receipt of request from the County for a rate determination.

Because of differences in treatment processes, date of construction, capacity, etc., it can be assumed that the conveyance and treatment charges for the proposed service district will be less than those applying to the Tryon Creek treatment plant and interceptor, which were $44.71 per million gallons. At this rate, assuming an average sewage flow of 40 gallons per minute for the combined Rivergate and shipyard areas, the conveyance and treatment charge would be approximately $78.00 per month. At 40 g.p.m. or 60,000 gallons per day, the flow from the proposed district would be one percent of the Portland treatment plant capacity. Assuming the total cost of City facilities utilized as two million dollars, the proposed district would be expected to contribute $20,000. as its share of the capital cost of the City treatment plant and interceptor.

Summary - O. and M. Costs

In addition to the initial capital cost contribution or City connection charge very roughly estimated as $20,000., the proposed district would be required to pay the following estimated recurring charges:

Electric Power			
Rivergate pumping station	$ 19.80/year	or	$ 1.65/month
Combined pumping station	120.00/year	or	10.00/month
Maintenance			
Labor	$1,870.00/year	or	$156.00/month
Materials	100.00/year	or	8.33/month
Conveyance & treatment	$ 936.00/year	or	$ 78.00/month
Totals	$3,045.80/year	or	$254.00/month

[illegible] are based on an [illegible] daily flows of 10 gallons per [illegible] which is the anticipated flow at that time when all vacant property in the district is occupied by industry having an employee density similar to that of the present tenants. With only the present occupants of the two areas, including Oregon Steel Mills, the average flow and the recurring costs should not be more than half of the above amounts.

Recapitulation of Capital Costs

(1)	Rivergate pump station & force main	$27,800.	
(2)	Gravity sewers in Rivergate	25,700.	
(3)	Shipyard pump station & force main	36,700.	
(4)	Gravity sewer, pump station to Container Corp. branch sewer	17,300.	
(5)	Gravity sewer from Container Corp. branch to north side of shipyard area	23,400.	
(6)	Container Corp. branch sewer	9,000.	
(7)	Est'd. share of City facilities cost	20,000.	
Total Capital Cost			$159,900.

Federal and State Participation

Under existing laws, the cost of the pumping station near the Beall gate and the force main to the City sewer may be shared by Federal and State governments through grants administered by the Oregon State Sanitary Authority and the Federal Water Pollution Control Administration. If funds are available, grants approximately 75% of $36,700. may be authorized. In addition, a loan and possibly a grant covering part of the remainder of capital costs may be authorized by the Department of Housing and Urban Development, subject to approval by C.R.A.G. and other agencies involved. The Federal Water Pollution Control Administration has advised that no funds for this project will be available during the remainder of the current fiscal year, that a very large backlog of applications for grants exists, and that the availability of funds for the coming fiscal year depends entirely on the generosity of appropriations. If, following approval of an application for grant, no funds are available, governmental decisions made in

July 1967 make possible a partial reimbursement subsequent to project completion and when funds are appropriated.

Although applications for Federal and State participation should be submitted with the hope that a grant or grants can be made, it seems advisable that financing should be arranged without planning on grant assistance.

Basis of Capital Cost Distribution

Since the depth and capacity of the proposed sewers and pumping stations are sufficient to permit the connection of branch sewers from all locations and sthroughout xthe proposed district, the whole area is benefitted and, within the limits hereinafter noted, should contribute toward the cost of pumping stations, force mains and additional sewer size and depth. Property which is within a distance permitting service connections to sewers actually constructed is more directly benefitted and should a greater proportion of cost than property to which additional lateral sewers must be built in order to provide service. For the purposes of this report, this distance of greater benefit and higher assessment is assumed as 200 feet measured on both sides of the sewer, or 400 feet total width.

Within the area which lies to the south of North Sewer Road and the former outfitting basin, existing cast iron sewers will be transferred from the existing to the proposed pumping station but no new gravity sewer lines will be built. This area will benefit only from the pumping station and its force main and should contribute only toward these facilities.

Sewers in the Rivergate area will be a part of the over-all development program for the Rivergate Industrial District and presumably will be paid for by The Port of Portland. Distribution of costs within the

Rivergate area shown conform to policies of The Port of Portland and is not attempted in this report.

Distribution of Capital Costs

In order to distribute costs, the following values have been measured from the project map or calculated:

Cost of 8" sewer with invert 7 feet deep, including allowance for paving, manholes, connections, etc.:	$ 5.00 per foot
✓Total acreage within Rivergate area:	325 Acres
✓ Total acreage within shipyard area:	330 Acres
	655
✓ Area south of N. Sever Rd. and former outfitting basin:	106 Acres
Area of 400' strip centered on gravity sewers within shipyard area but excluding branch sewer serving Container Corp. only	35 Acres

DISTRIBUTION OF CAPITAL COST TO RIVERGATE AREA:

Facilities serving Rivergate area only, (1) & (2). .	$53,500.
Share of shipyard pump station & force main, (3) $36,700. x 325/655 = ...	18,210.
Share of additional sewer size and depth in shipyard area, (4) & (5) ($40,700. - 3,800' x $5.00) x 325/(655-106) =	12,846.
Share of cost of City facilities, (7) $20,000 x 325/655 = ...	9,924.
Capital cost assigned to Rivergate area	$94,480.

DISTRIBUTION OF CAPITAL COST WITHIN SHIPYARD AREA:

To area south of Sever Road and former outfitting basin:

Share of pump station & force main, (3) $36,700./655 = ...	$56.03 per acre
Share of cost of City facilities, (7) $20,000./655 = ...	30.54 per acre
Total,	$86.57 per acre

To areas more than 200 feet from proposed sewers but for which service can be made available by constructing 8" lateral sewers:

Share of pump station & force main, (3) $36,700./655 = ...	$56.03 per acre
Share of cost of City facilities, (7) $20,000./655 = ...	30.54 " "
Share of additional sewer size and depth within shipyard area, (4) & (5) ($40,700.-3,800'x $5.00)/(655 - 106) = ...	39.53 " "
Total	$126.10 per acre

To areas within 200 feet from proposed sewers:

Share of pump station & force main, (3) $36,700./655 = ...	$56.03 per acre
Share of cost of City facilities, (7) $20,000./655 = ...	30.54 " "
Share of total cost of sewers within shipyard area, excluding branch serving only Container Corp., (4) & (5) ($40,700. - 3,800' x $5.00)/(655 - 106) = . (3,800' x $5.00)/35 = ...	39.53 " " 542.86 " "
Total	$668.96 per acre

The total capital cost assigned to the shipyard area would be as follows:

Area south of Sewer Road,	106 acres @ $86.57 =	$ 9,176.42
Area more than 200' from sewers,	189 acres @ 126.10 =	23,832.90
Area within 200' from sewers,	35 acres @ 668.96 =	23,413.60
Branch sewer serving only Container Corp. =		9,000.00
Total assigned to shipyard area:		$65,422.92
Total assigned to Rivergate area:		94,480.00
Total distributed capital cost		$159,902.92

The assessment rates above do not include the cost of connections between the buildings to be served and the proposed main sewer lines. Those buildings which are already connected to the 6" cast iron sewers which are to remain in service will require no work or connections other than the transfer of the 6" sewer termination from the old to the new pumping station. In order to provide sewer service to the Container Corp. of America, an 8" branch or lateral sewer must be constructed along the south side of the plant to intercept existing outlets from the building. This lateral will serve only Container Corp. and, until sewer services are needed along the north side of the outfitting basin, the cost of this lateral must be paid by Container Corp. in addition to the applicable assessment rates for acreage. For Container Corp., the cost of sewer construction would be as follows:

Area more than 200' from main sewer,	6.48 acres	@ $126.10 =	$ 817.13
Area within 200' from main sewer,	3.05 "	@ 668.96 =	2,040.33
8" lateral and connections to building sewers			9,000.00
Total			$11,857.46

In all probability, the property owners within the shipyard area and The Port of Portland will wish to explore other means for distributing the cost of this project as well as modifications of the scheme described above. This method of distribution is intended as a guide for discussion rather than an inflexible schedule of rates.

Financing Method

As mentioned before, if the project is approved, it is expected that The Port of Portland will provide funds for the Rivergate portion of the costs from Port revenues and monies marked for Rivergate Industrial District development. Within the shipyard area, there are so few property owners that the expense and trouble of a bond issue to finance the project seems

unnecessary. In most instances, the property owners or corporations involved would be able to furnish their shares or assessments from reserves or borrowed funds. The selection of method for financing this project should be made by the property owners as best suits their capabilities.

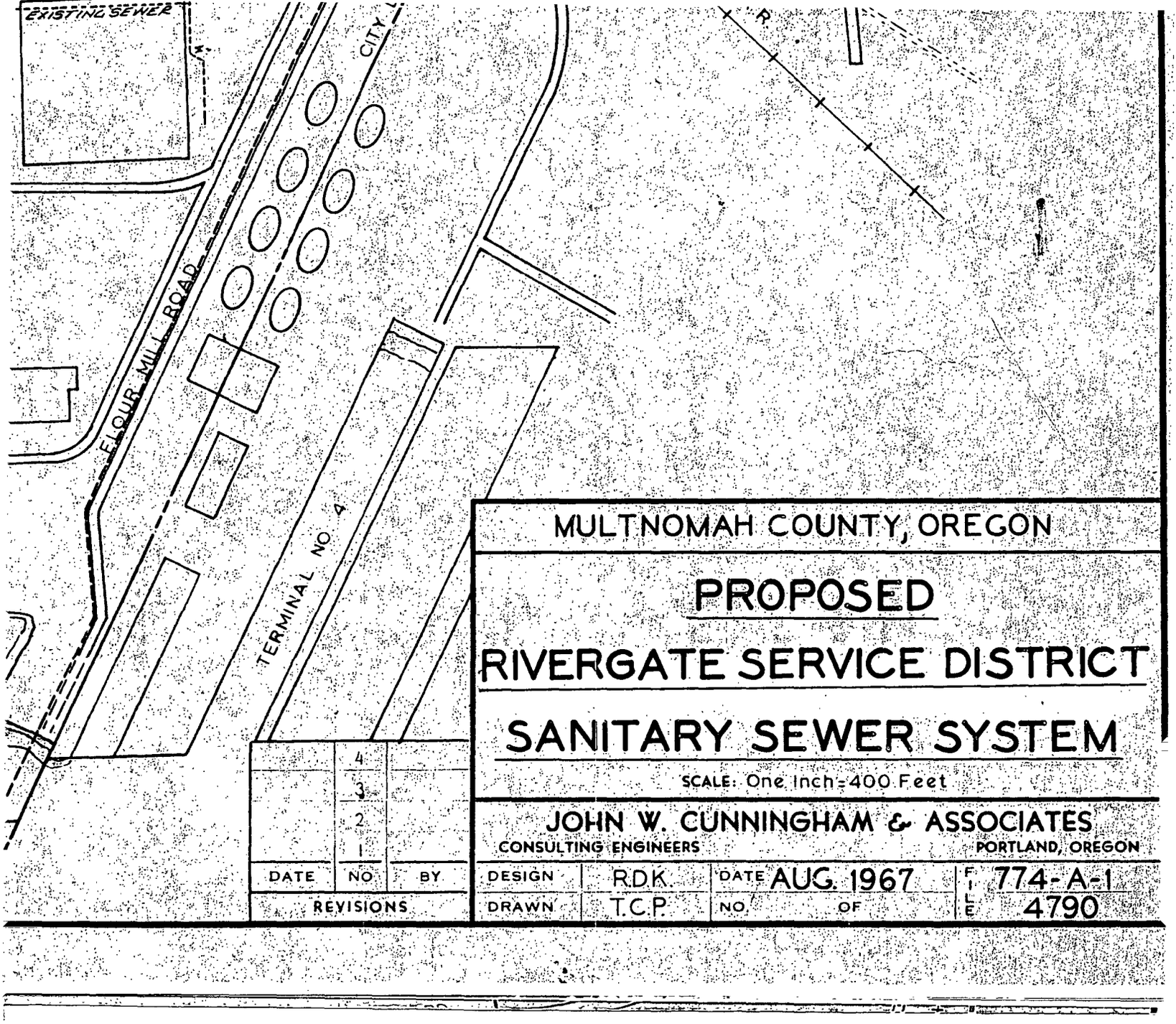
CONCLUSIONS AND RECOMMENDATIONS

Action by the Oregon State Sanitary Authority requires that the industries occupying the site of the former Oregon Shipbuilding Corp. must cease discharging untreated sewage into the Willamette River. Although some septic tanks are now in use and are operating satisfactorily, County sanitation authorities will not permit construction of additional septic tanks. Permission to continue the use of existing septic tanks, including those in the Rivergate area, is temporary.

The only permanent solution to sewerage problems in the area of the proposed service district is a sewage collecting system connecting to the St Johns Interceptor, which will carry wastes to Portland's main sewage treatment plant. A small "package type" plant which could treat sewage without connection to City sewers is not favored by State or County authorities and would require replacement or abandonment as the area develops.

Although a less expensive arrangement, involving smaller gravity sewers, smaller diameter and longer force mains, and lower pumping capacities could suffice for the present, the sewer sizes, grades, and the general arrangement shown on the plan are intended for service both now and in the future, without enlargement or replacement. It is recommended that the sewer system be built approximately as shown.

The estimated construction cost is $159,900., including 20% allowance for contingencies and engineering. Cost for operation and maintenance of the system is estimated to be $254. per month.



MULTNOMAH COUNTY, OREGON

PROPOSED
RIVERGATE SERVICE DISTRICT
SANITARY SEWER SYSTEM

SCALE: One Inch = 400 Feet

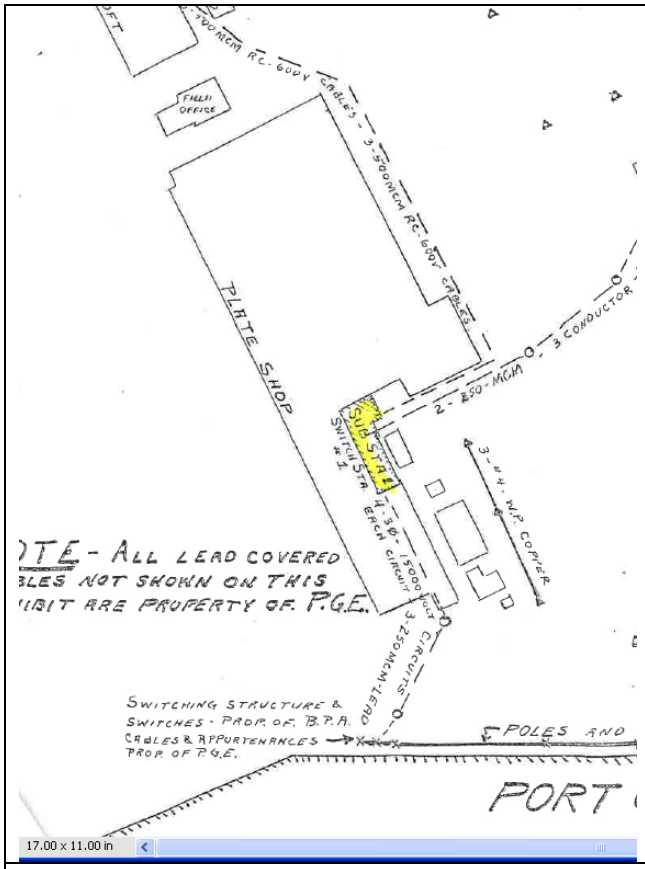
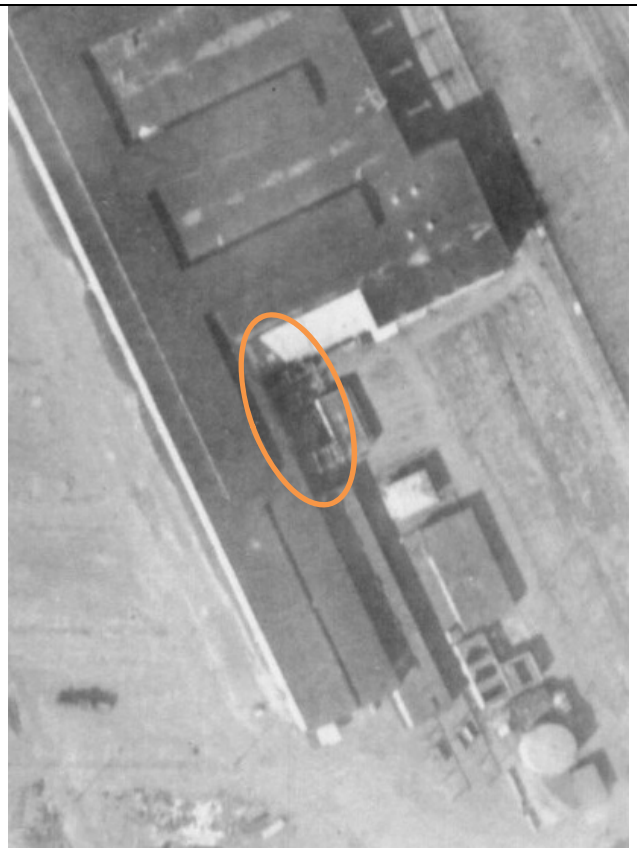
JOHN W. CUNNINGHAM & ASSOCIATES
CONSULTING ENGINEERS — PORTLAND, OREGON

DATE	NO	BY
	4	
	3	
	2	
	1	

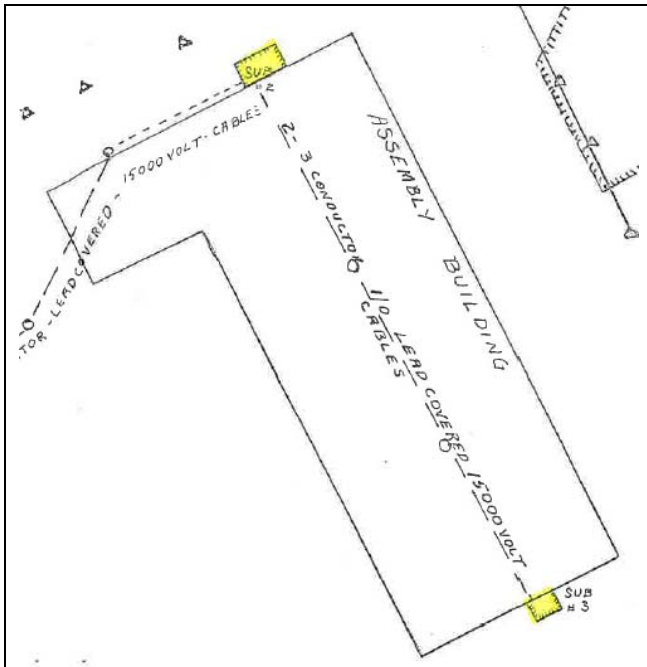
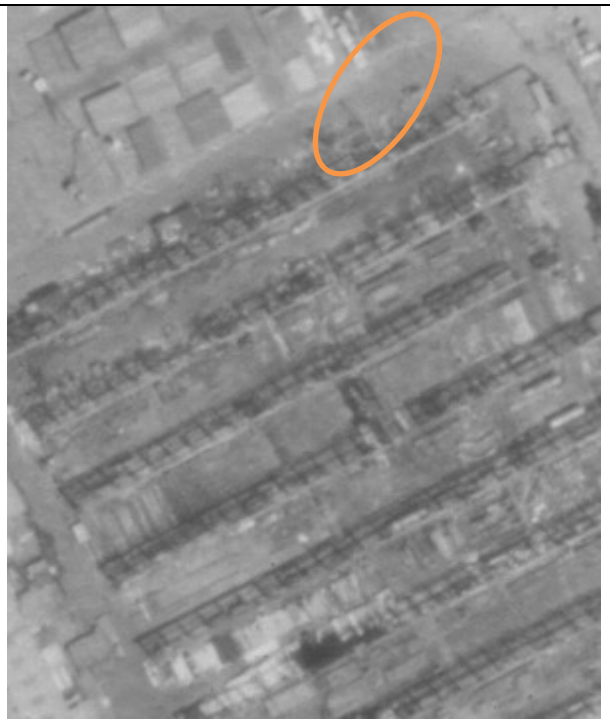
REVISIONS

DESIGN	R.D.K.	DATE AUG. 1967	FILE 774-A-1
DRAWN	T.C.P.	NO. OF	4790

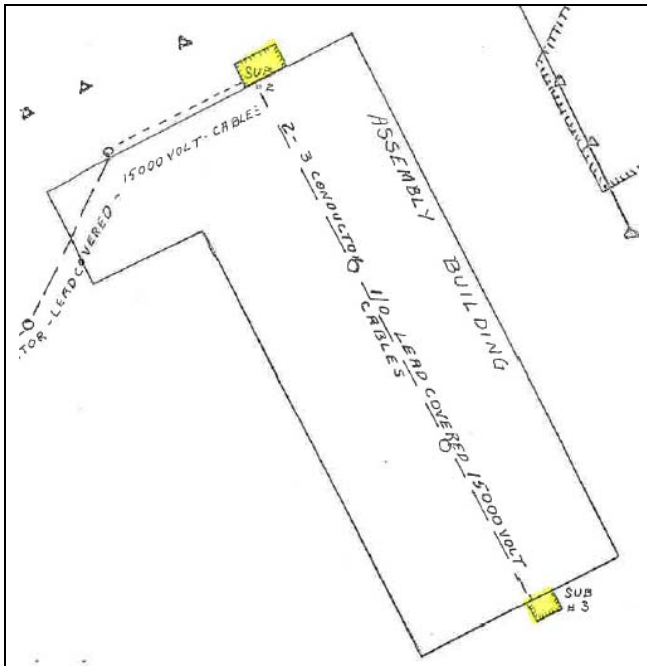
Substation 1: Plate Shop

		
Portion of map attachment to 1950 Bill of Sale showing Substation #1 and Switching Station #1 (collocated).	Portion of 1956 aerial photo with fenced equipment area visible. Building may not be in use: no vehicles are parked nearby and weeds appear to be growing around it.	Portion of 1961 aerial photograph showing that the electrical equipment at substation 1 has been removed and the building does not appear to be in use.

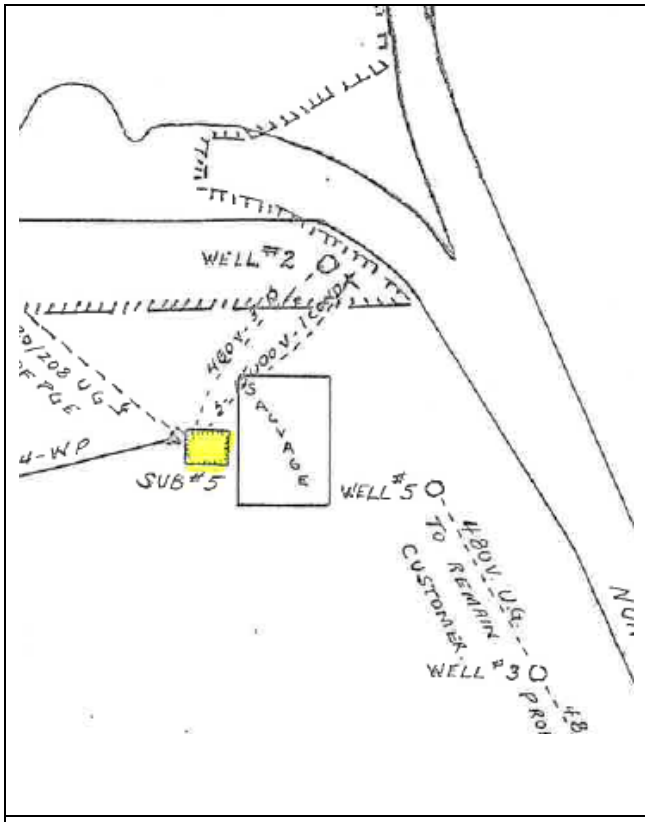
Substation 2: Assembly Building North

		
Portion of 1950 map showing Substation 2 on the north side of the Assembly Building, and Substation 3 on the south side.	A portion of the 1956 West aerial photo showing a close-up view of the north end of the Assembly Building. The electrical equipment site can be distinguished by the shadow of the overhead pole in that location.	A portion of the 1961 aerial photo shows the assembly building as an apparently damaged shell. None of the tanks, sheds or other equipment previously visible on the north end of the building are apparent any longer.

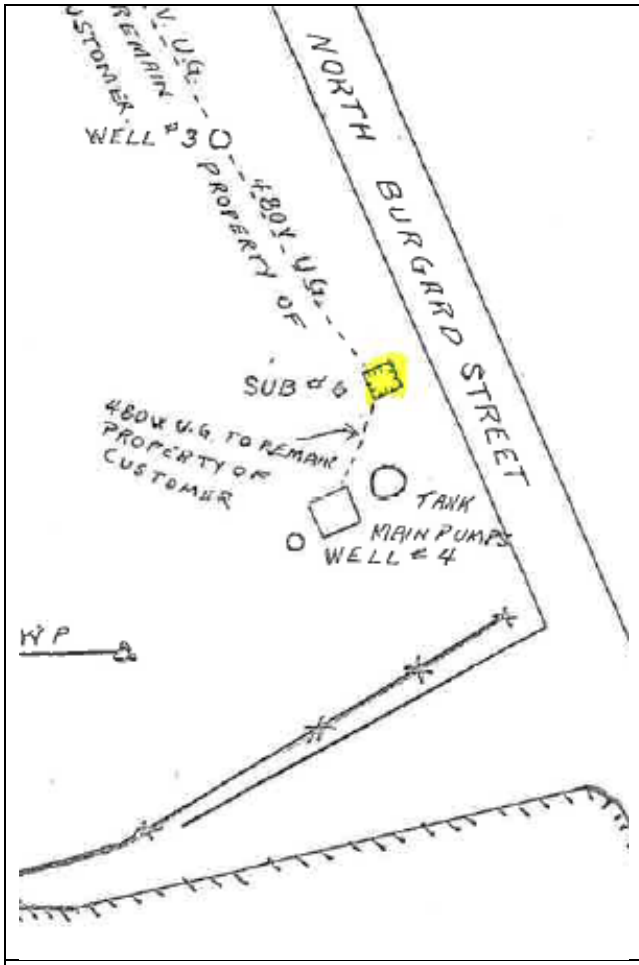
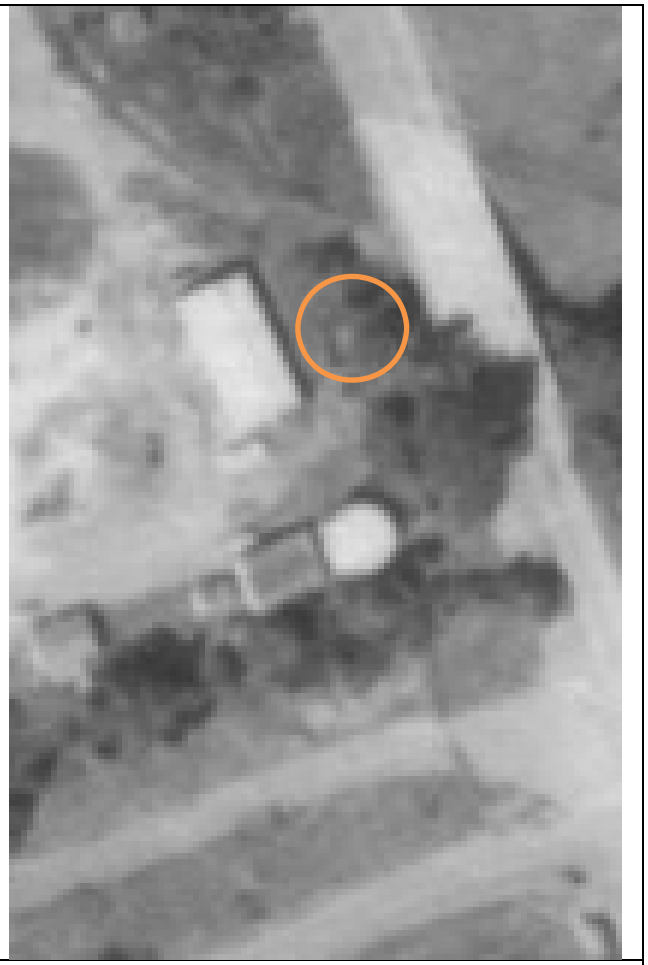
Substation 3: Assembly Building South

		
Portion of 1950 map showing Substation 2 on the north side of the Assembly Building, and Substation 3 on the south side.	None of the aerials show distinguishable equipment or structures in this location. This view is from 1956 and is the clearest.	By 1961, most of the building is gone. Small sheds or possibly lumber piles are located along the former south end.

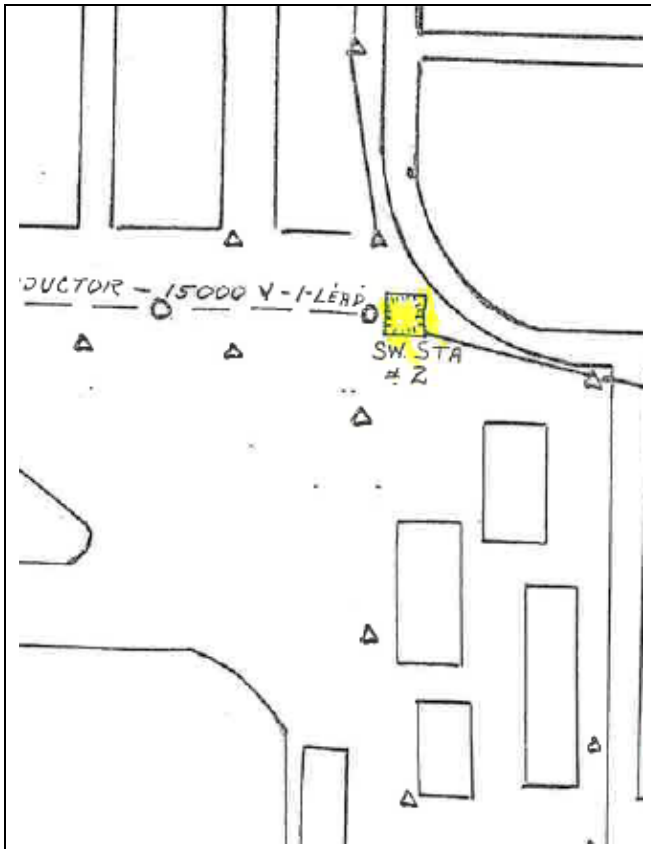
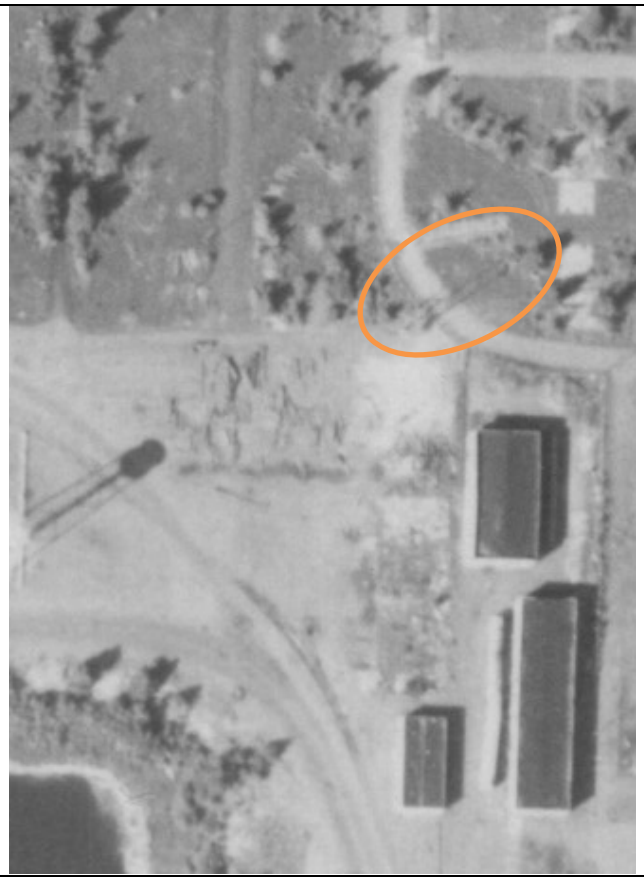
Substation 5: Salvage Building

		
The 1950 map shows a substation west of the Salvage Building. No photos provide clear views of the equipment, but this location is empty by 1968.	Shadow of what could be equipment in the Substation 5 location is visible in this 1964 aerial photo.	By 1968, any equipment that may have been in this area is gone and vegetation is growing up.

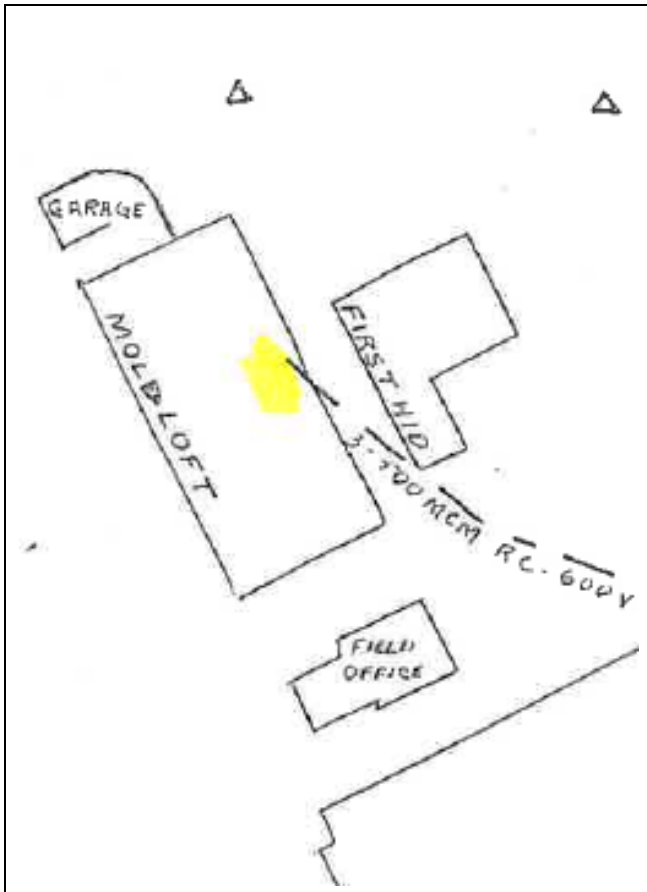
Substation 6: Main Pump House

		
The 1950 map shows a substation located in the southeast corner of the shipyard near a water tank and well pumps.	Portion of 1963 aerial – no photo shows the equipment location distinctly, but it is possible that this photo shows a platform or small shed in this location.	By 1968 a new building has been constructed in this area and no built shapes are visible in the mapped location of the substation.

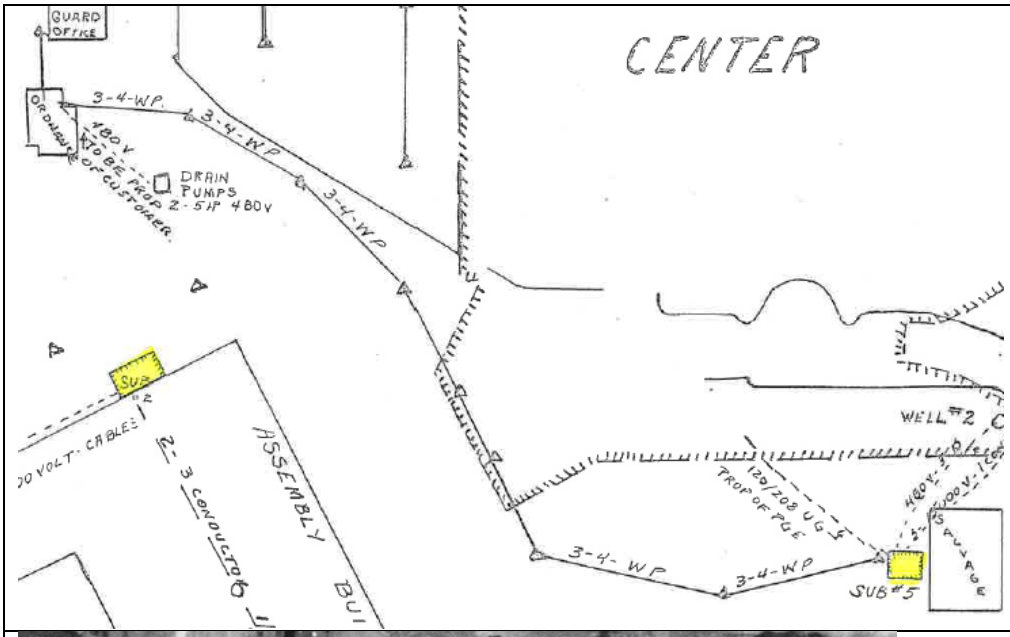
Switching Station 2

		
	The 1964 aerial photo shows the shadow of some type of equipment in the location mapped as switching station 2.	By 1968 no indications of an equipment installation are apparent, and the area has reverted to shrub-scrub.

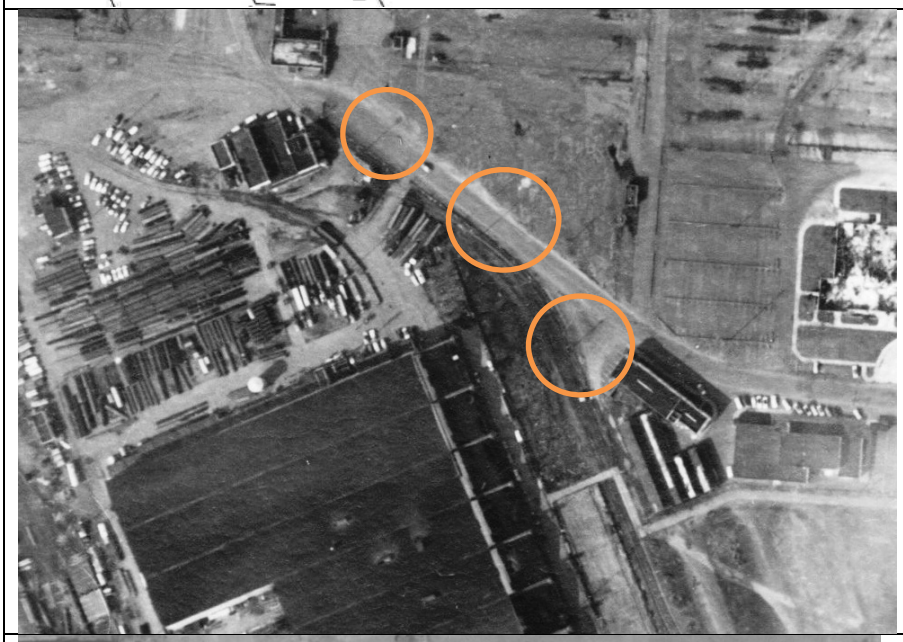
Mold Loft Transformers

		
The 1950 contract lists three transformers in storage in the Mold Loft building. It is unknown whether these were installed.	The 1956 photo shows the building maintains the same configuration and there are some signs of activity around it.	By 1961 this section of the shipyard appears unused and most surrounding structures have been demolished.

Overhead Distribution System: South



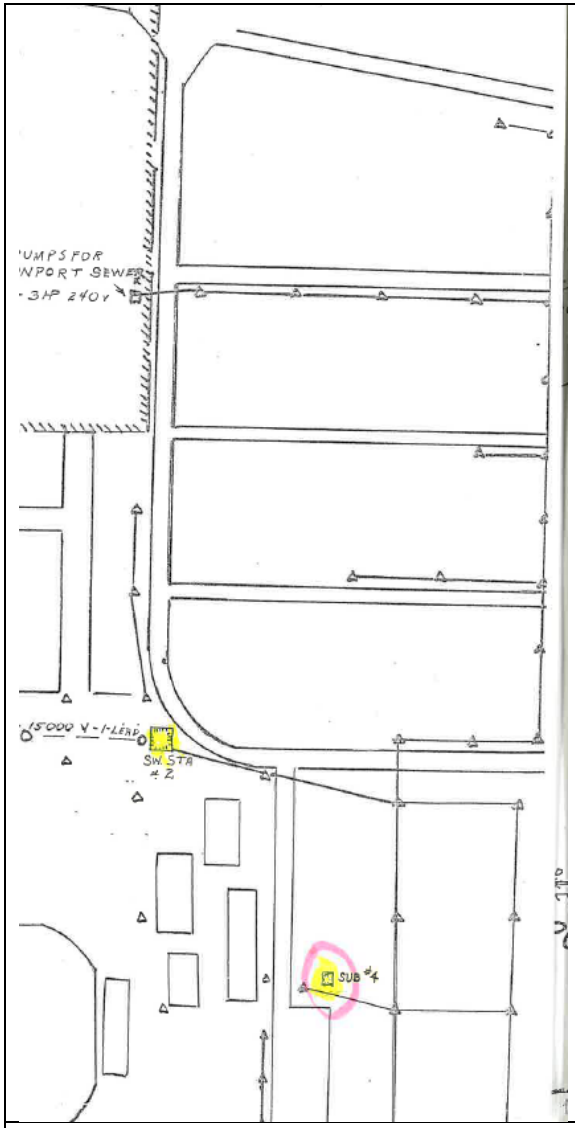
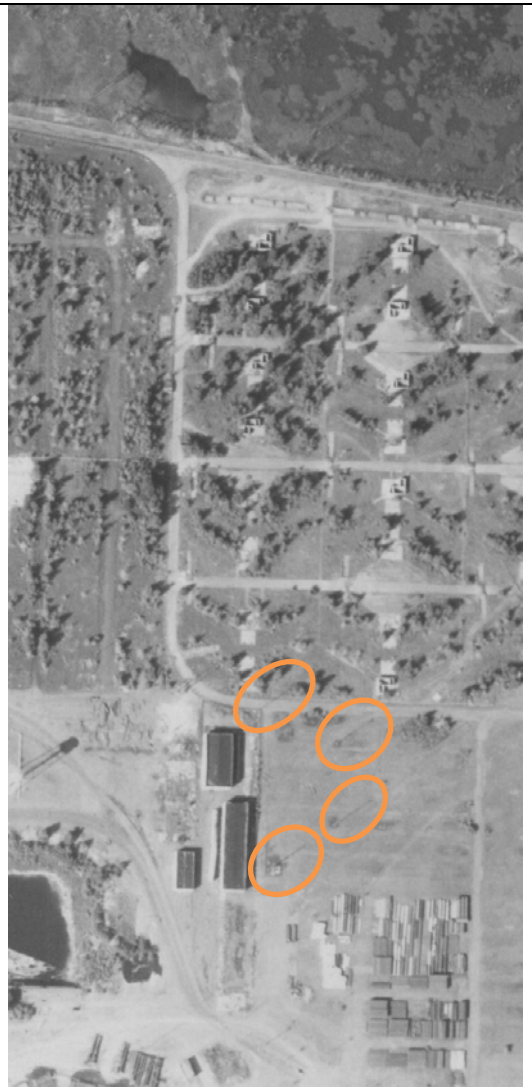
The 1950 contract lists the components of the existing overhead distribution system, and the map shows these approximate locations.



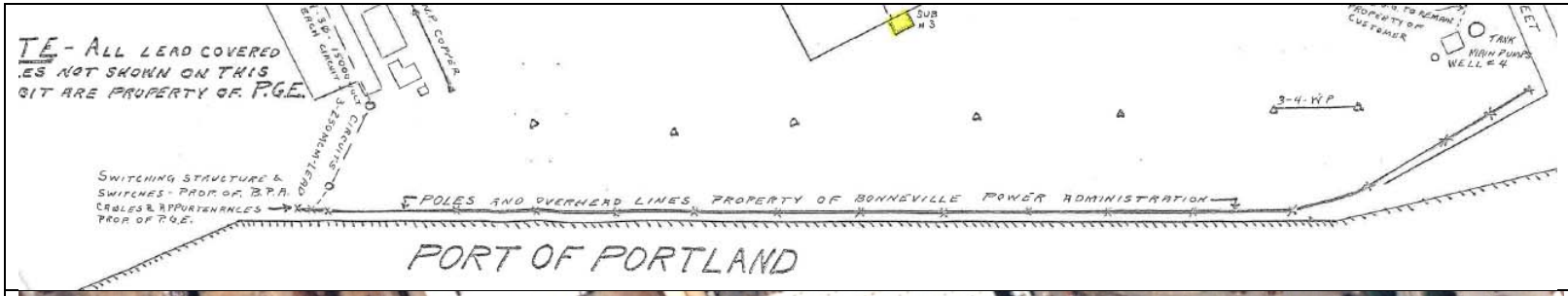
In 1956, shadows from the transmission line poles are visible in the previously mapped locations.

By 1961 the ordinance shed is gone and the poles are no longer visible along the mapped route, although other transmission line shadows can be seen, for example in the parking area at the upper right of this photo.

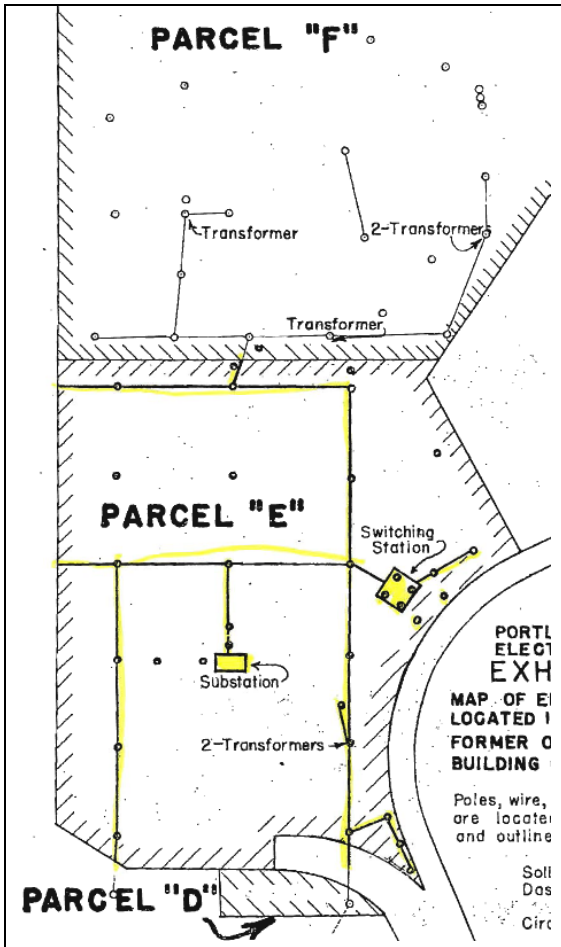
Overhead Distribution System: North

		
The west end of the shipyard was apparently served by underground distribution lines, but the 1950 map shows overhead lines north and east of switching station 2. Note that Sub #4 was not listed among the equipment purchased by PGE.	In 1964 you can see shadows of overhead poles and an equipment platform in substation 4's location (not part of PGE transaction).	By 1968, the equipment platform site is gone and the locations of overhead distribution poles have changed.

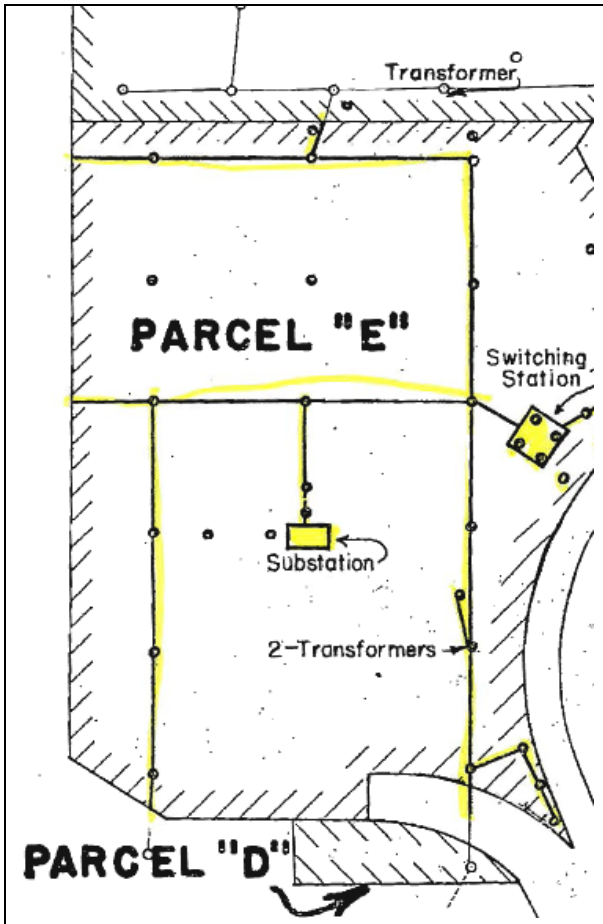
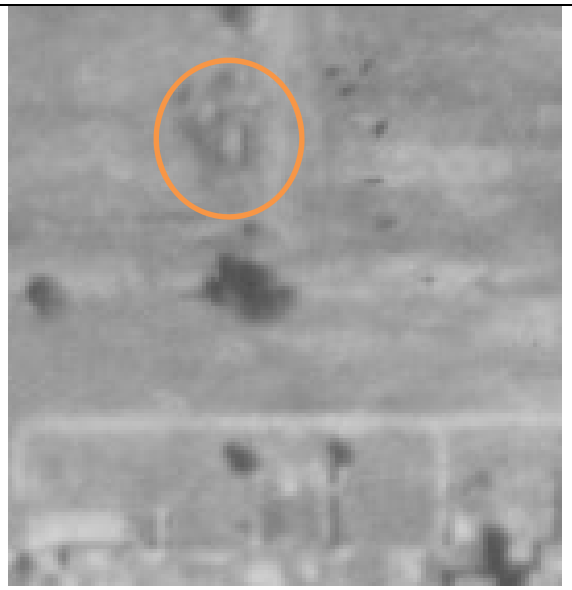
Rights to Dulien Interest in BPA Power line

	The 1952 documents do not include a map showing the BPA overhead line, but I presume it to be the one along the southern parcel boundary.
	Shadows of overhead distribution system poles are clearly visible along the BPA alignment in all of the aerial photographs. This one is from 1994.

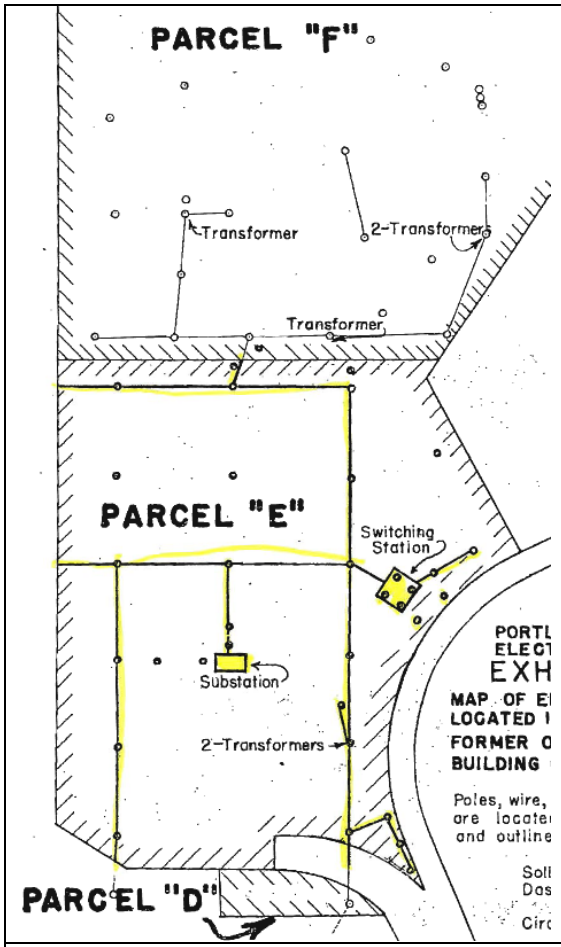
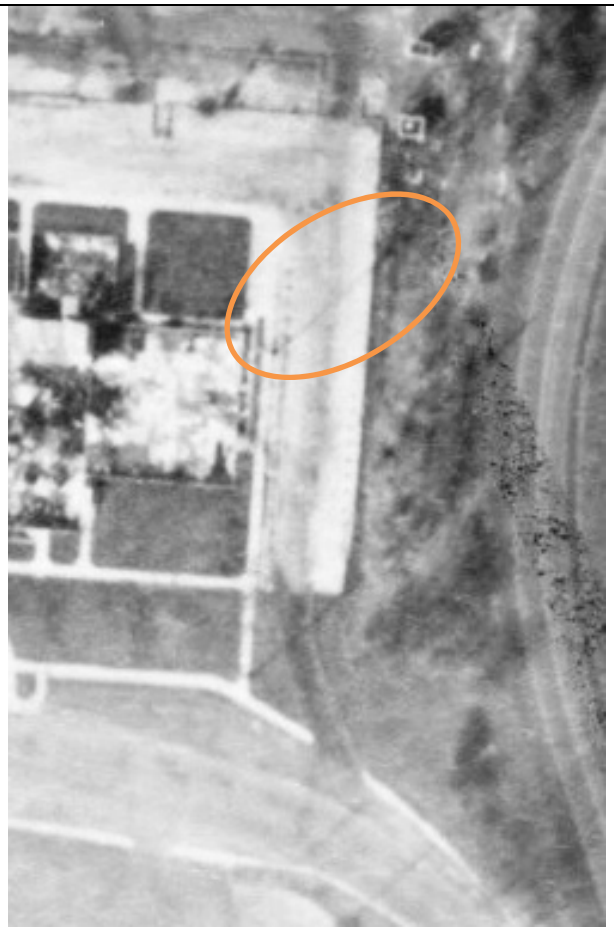
Parcel E Switching Station

		
The 1954 documents show the electrical system on Parcel E. Neither parcels D or F were apparently included in the transaction	1956 aerial photograph showing possible equipment platform in mapped location of Parcel E Switching Station.	The 1961 aerial photo shows that this location is now utilized for container storage. No apparent equipment or platform is visible any longer.

Substation: Administration Building

<table>
<tr>
<td> 
</td>
<td>  </td>
<td> 
By 1961, the mapped location appears to be an empty platform
 </td>
</tr>
<tr>
<td>The foundation of the Administration Building is a recognizable landmark in all of the early aerial photos. This substation was located just to its north and was listed as part of the 1954 Parcel E transaction.</td>
<td>The 1956 aerial photograph shows a small building or shed in the mapped substation location.</td>
<td>By 1963 the site is definitely vacant and indistinguishable from the abandoned land surrounding it.</td>
</tr>
</table>

Parcel E Distribution System Transformers

		
The 1954 description and map of the distribution system on Parcel E lists two pole mounted transformers. The map shows these adjoining the east side of the Administration Building.	The 1956 aerial photo shows the shadows of the pole in the mapped location of the pole-mounted transformers.	By 1961, these poles are gone, although the shadows of the nearby poles on North Burgard are clearly visible.

#2355 Schintzer/Burgard REPORT
Site History Review 9/00

#2355 - SCHNITZER STEEL INDUSTRIES REPORT
MULTNOMAH 09/25/00
SITE HISTORY REVIEW

Site History Review

Burgard Industrial Park
12005 North Burgard Road
Portland, Oregon

Prepared for
Schnitzer Investment Corp.

September 25, 2000

BRIDGEWATER GROUP, INC.

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Figures

SECTION 1

INTRODUCTION

This Site History Review (SHR) report presents the history of the Schnitzer Investment Corp (SIC) Burgard Industrial Park in Portland, Oregon (Site) (Figure 1-1) and surrounding properties. This SHR report was prepared in accordance with the June 16, 2000 Voluntary Agreement (Agreement) between SIC and the Oregon Department of Environmental Quality (DEQ).

1.1 Purpose of the Site History Review

The purpose of the SHR is to develop a sufficient understanding of the site history to assist in determining if a full remedial investigation is appropriate, and if so, to guide the preparation of the work plan for the remedial investigation. In particular, the SHR is focused toward identifying:

Potential sources of hazardous substances – Locations where significant quantities of hazardous substances are, or have been, used or stored on the Site.

Potential releases of hazardous substances – Sources where releases of hazardous substances are known to have occurred or where such releases are suspected based on the nature of the identified source. Sources where releases have reasonably likely occurred will be considered "features of concern" or "FOCs."

Possible migration pathways – Soil, groundwater, surface water, and air pathways by which hazardous substances may migrate from the identified possible release areas to the Willamette River.

The SHR is part of the Pre-RI Assessment that is being performed as the initial task under the Agreement between SIC and DEQ. Consistent with the Agreement, if the Pre-RI Assessment shows that there are no ongoing releases on the Site that are migrating to the Willamette River, the Scope of Work under the Agreement will be considered complete and the priority of the Site will be reevaluated by DEQ.

In the event that FOCs and associated potential pathways to the Willamette River are identified, the remedial investigation program will be developed to assess the identified FOCs and pathways.

1.2 Scope of Site History Review

The following tasks were performed as part of the SHR:

- Review historical aerial photographs.

- Review historical drawings and site plans.
- Review available Sanborn fire insurance maps.
- Review historical societies files.
- Interview SIC representatives.
- Interview available and knowledgeable site employees.
- Review City building records.
- Review SIC files.
- Review historical regulatory agency files.

Sanborn Fire Insurance maps are not available for the Site area.

1.3 Site Description

The Burgard Industrial Park (Site) consists of an approximate 200-acre site located near the 12000 Block of North Burgard Road in north Portland, Oregon (Figure 1-1). Figure 1-2 presents a 1998 aerial photograph of the Site. Figure 1-3 presents a general site plan of the Site.

As noted on the figures, the Site does not include the Northwest Pipe property, which is encircled by the Site. Consistent with the Agreement between SIC and DEQ, the Premier Edible Oils property is not included in the Site. Other surrounding properties include Smurfit, Time Oil, Union Carbide, Portland General Electric, and Port of Portland Terminal 4.

Land use at and around the Site is industrial. The closest residential development is located over ½ mile southeast of the Site. Ground surface at the Site includes paved roads and parking lots, graveled surfaces, railroad tracks, paved work areas, buildings, and bare ground.

1.4 Project History

In February 1999, DEQ requested that Schnitzer provide information regarding past and current activities at the Site. On March 19, 1999 Schnitzer provided a complete and detailed response to DEQ's information request. On November 24, 1999 DEQ requested Schnitzer to perform a Remedial Investigation (RI) on the Site. A site Strategy Recommendation was included in the DEQ packet requesting the RI.

On December 22, 1999, Schnitzer notified DEQ that they intended to participate in the DEQ Voluntary Cleanup Program and perform the RI. Schnitzer and DEQ entered into a Voluntary Agreement on June 16, 2000.

SECTION 2

SITE HISTORY

2.1 General Periods of Site History

For the purposes of the SHR, the history of the Site is divided into four periods, as follows:

- Prior to 1941
- World War II shipyard (1941 through 1945)
- Post War (1945 through 1972)
- Schnitzer ownership (1972 through current)

The results of the SHR are presented in terms of these four periods.

2.2 Prior to 1941

2.2.1 Sources of Information

The primary source of information for this period is aerial photographs from 1936 and 1940. Information regarding site conditions prior to 1941 was also obtained from a report describing the OSC shipyard construction in 1941.

2.2.2 Site Ownership

Prior to 1941, the Gatton family owned most of the Site. Based on the presence of oil storage tanks, a portion of the site was owned by Northwest Oil company starting in 1938 (See Section 2.2.3).

2.2.3 Site Features and Activities

Prior to 1939, there were no structures and no activities on the Site. The 1936 aerial photograph shows the Site during this period consisting of low-lying sand deposits and shallow marsh lands.

In 1938 or 1939, Northwest Oil, a predecessor to Time Oil, constructed an oil storage terminal near the southwest edge of the current slip. Figure 2-1 shows the approximate location of the oil terminal relative to the current boundaries of the Site. The terminal consisted of six, above-ground, cylindrical tanks.

Based on descriptions of site conditions encountered during construction of the OSC shipyard (See Section 2.3.1), releases of oil occurred from the

Northwest Oil tanks. Initial excavation work performed for the shipyard construction noted that a "pond of oil had formed from the drainage of the tanks" in the area of the former Northwest Oil tanks (Osborn, 1945). This area, along with most of the Site as described in Section 2.3.2, was filled with dredge sand. There is no report of the oil-contaminated soil being removed prior to filling the Site.

Other than the presence of the Northwest Oil terminal, the land prior to the construction of the shipyard was described as "lumpy swamp" with "brush" (Osborn, 1945).

2.3 World War II Shipyard

2.3.1 Sources of Information

The primary source of information for the shipyard period is a 1945 report written by Julia Osborn and published by the Oregon Shipbuilding Corporation (OSC) on the shipyard construction and operation. A copy of the report was obtained from the Oregon Historical Society. Other sources of information included 1945 drawings of the shipyard facility obtained from SIC, photographs of the site obtained from the Oregon Historical Society, and an aerial photograph from 1944 from the U.S. Army Corps of Engineers.

2.3.2 Site Ownership

Based on drawings of the shipyard, the Site was owned by three primary parties during the shipyard period; of the City of Portland, the U.S. Government, and OSC. In general, OSC owned what was the shipways and is now the river front portion of the Schnitzer Steel yard, the City of Portland owned the southeast portion of the Site, and the U.S. Government owned the northeast portion of the Site.

Review of the title histories also note that these three parties, City of Portland, the U.S. Government, and OSC owned most all of the Site during this period.

2.3.3 Site Features and Activities

The OSC facility was one of several shipyards that were constructed and operated to provide ships for World War II. Over 450 ships were constructed at the OSC facility between 1941 and late 1945. Figure 2-2 and Figure 2-3 shows the general layout of the shipyard during the shipyard operations. Figure 2-4 shows a photograph of the facility in 1943. Figure 2-5 shows an aerial photograph of the shipyard in 1944. Figure 2-6 and Figure 2-7 show representative photographs of the shipyard during its operation.

The last ship was launched in October 1945 and the last ship departed the shipyard on November 23, 1945. The shipyard essentially ceased operations in December 1945.

2.3.3.1 Shipyard Construction

In January 1941, the U.S. Government first appropriated money to the OSC for construction of a shipyard on the Site. Construction was started in February 1941 with moving the Northwest Oil terminal from where shipway 1 was constructed. Figure 2-1 shows the location of the Northwest Oil Company tanks that were removed to start the shipyard construction.

As noted in Section 2.2.2, oil-contaminated soil was encountered after removal of the above-ground tanks and as grading of the area was started. The tanks were reportedly "drained" on to the ground by employees of Northwest Oil prior to removing the tanks (Osborn, 1945). The tanks were moved to a location just north of the slip and were located there until mid to late 1943 (Figure 2-4). The tanks were then moved again, presumably using the same method of draining; this time to their current location on the Time Oil site.

Construction of the shipyard included placement of fill throughout the Site to fill-in the existing low-lying marsh lands. More than 15 feet of "gravel" fill was placed on the Site (Osborn, 1945). Pilings were driven to support the shipways.

The deep draft slip was dredged along the northern edge of the original OSC site.

The first buildings to be constructed were the administration building and the Mold Loft building. Shortly after, the Blacksmith/Forge Shop, Machine Shop, Warehouse, and Plate Shop were completed. By the end of October 1941, the main production facilities at the shipyard were generally completed. The barracks in the northeast portion of the Site were constructed in 1943.

2.3.3.2 Shipyard Features and Operations

For the purposes of the SHR, the shipyard operations were reviewed according to the following eight general areas:

- Plate Shop, Assembly Building, and shops
- Shipways
- Storage and Fitting area
- Northern Boiler Erection and Paint Storage Area
- Barracks
- Parking Area and Administration Building
- Salvage Area and Waste Management

- Fitting Dock and Support Buildings

The general locations of these areas are shown on Figure 2-2 and Figure 2-3. Figure 2-2 shows the yard layout in July 1942. Figure 2-3 shows the yard layout in December 1944.

A system of electrical, water, and sewer services was constructed to serve the shipyard. An acetylene generation and distribution system was also present on the shipyard site.

Pontoons were constructed at the shipyard near the end of the shipyard operations. In August 1945, the outfitting dock and adjacent shops along the southern edge of the dock were destroyed in a fire.

The primary areas/features noted above are described below.

Plate Shop, Assembly Building, and Shops

The Plate Shop, Assembly Building, and Shops area is where most of the ship elements were manufactured prior to assembly. The steel plates would be cut and knuckled into the necessary shapes in the Plate Shop. Oil-fired furnaces were used to heat the plates prior to shaping in the southeast portion of the Plate Shop. Remnants of the heating and shaping process were collected for salvage and the concrete floor was regularly swept (Osborn, 1945). Surface treatment of steel plates was performed in this area during the later periods of the shipyard operations when pontoons were being constructed. No sumps or drains are noted on the Plate Shop drawings.

An "Oil House" was located east of the Plate Shop near the western edge of the Site. Based on the description of an "Oil Dock", in the shipyard history narrative, products reportedly received and stored in this area included lubricating oils, acetone, anti-freeze, and grease (Osborn, 1945).

The cut and shaped elements were moved to the Assembly Building where the elements were trimmed, welded, and assembled into sections. Rivet holes were prepared in the Assembly Building. The sections were then transported to the shipways for final assembly of the ship. No sumps or drains are noted on the Assembly Building drawings.

The main processes performed in the Plate Shop and Assembly Building were supported by several shops including the Mold Loft, Machine Shop, Sheet Metal Shop, and the Rigging Loft. Patterns for the various elements were prepared in the Mold Loft. The Machine Shop included numerous drill presses, saws, grinders, punch and shear machines, and milling machines. Tools and patterns were prepared in the Machine Shop and the shop included an electric furnace to heat metal for machining. No sumps or floor drains are noted on the Machine Shop drawings.

Thin sheets of steel were cut and rolled into cylinders for various uses on the ships in the Sheet Metal Shop. The Sheet Metal Shop also prepared finishing sheets for the various ship coverings and finished interior surfaces. No sumps or floor drains are noted on the Sheet Metal Shop drawings. The Rigging Loft supported the crane operators and material movers.

Shipways

There were 11 identical shipways along the western edge of the Site. Each shipway was about 475 long by 87 feet wide and was constructed of wood piles and timbers. The shipway was constructed about 5 feet above the ground and no activities occurred on the underlying ground surface. A craneway consisting of a 28.5-ft gage rail was located between each shipway.

Sections of the ship that were assembled in the Assembly Building were moved to the shipways, placed, and welded to form the ship. Specialty crews were responsible for particular sections (e.g. ship bottom, bulkheads, rails, pipes) and moved from way to way as each ship progressed. Cutters, welders, and riveters followed each crew and fitted and attached the sections together.

The exterior of the ships were painted in the shipways. "Anti-corrosive" paint was spread on the exterior of the hull below the water line and a final coat of "anti-fouling" was applied immediately before the ship was launched (Osborn, 1945). Because tributyl tin (TBT) was not in use during the operations of the shipyard, the "anti-fouling" coat would not have contained TBT. Lead-based paint (i.e. "Red Lead") was used on some interior and top deck surfaces.

Consistent with the overall importance placed on conserving and reclaiming materials, photographs of the ship ways note clean areas and a lack of refuse or evidence of paint spillage. Figure 2-6 shows the general lack of spills or releases in the shipway area. Descriptions of the ground surface beneath the shipways did not note any evidence of releases (e.g. oily ground, paint drippage, etc.).

Storage and Warehouse Area

Starting in late 1943, the northwest portion of the Site was used for storage. Ship materials, primarily steel sheets, were stored in rows that were serviced by a grid of graveled roads and rail road tracks.

A large warehouse was constructed in mid 1943 along the northern edge of the slip to support the ship fitting activities. The Warehouse Building was one of the largest buildings in the shipyard and was used to receive, store, and distribute the materials and supplies used to outfit the ships. The warehouse was located on what is now the Smurfit property and is not included in the Burgard Industrial Park "Site".

Northern Boiler Erection and Paint Storage Area

In late 1943, the shipyard expanded to include the area on the north side of the slip, adjacent to the Willamette River. This area is north of the Site. Prior to late 1943, seven above-ground storage tanks and an outside drum storage area were located in this area. A dock extended out into the Willamette River, presumably to transfer oil products to and from the tanks. Based on the shipyard site maps and the site description, these tanks were not associated with the shipyard. Based on the description of the initial shipyard construction, these tanks were the Northwest Oil tanks that were previously moved from where the slip was constructed in early

1941. In 1943, the tanks were moved further north to their current location on the Time Oil property.

Once the oil dock was removed, the Boiler Erection and Paint Storage buildings were constructed in this area. Boilers for the ships were assembled in the Boiler Erection Building. Paint and paint supplies were stored in the Paint Storage Building. Prior to late 1943, these activities were performed on the shipyard area south of the slip.

Barracks

The barracks were constructed in the northeast corner of the Site in mid to late 1943 and were completed in January 1944. The barracks were single story buildings with two-person rooms and a single bathroom. The barrack area also included a mess hall, theater, gymnasium, recreation building, fire station, and clinic. Single workers were housed in the barracks.

Parking Area and Administration Building

The parking area was constructed east of the head of the slip for workers commuting from offsite and for buses that were used to transport workers from offsite. The parking area was constructed by filling the low-lying area with dredge fill material and capping it with a gravel surface. The OSC administration building was constructed on the south side of the parking lot.

Salvage Area and Waste Management

The Salvage Building was located in the southeast corner of the Site. Given the shortage of raw materials during the war period, a great emphasis was placed on maximizing recovery of all materials. Scrap metal was collected from all of the manufacturing and machining areas and transported to the salvage building which was described as a "...large, well-equipped building are *(sic)* devoted to getting the last possible value out of the yard's scrap" (Osborn, 1945). There was an entire crew assigned to collect refuse and scrap from all areas of the shipyard, including the shoreline, for reuse or proper offsite disposal. The crew used about 200 "skips" to collect and manage the scrap and refuse on the Site (Osborn, 1945).

Electric cable ends were reportedly burned in the salvage area so that the wires could be pulled from their casings and the lead recovered (Osborn, 1945). Common practice was to burn the cables in drums. Waste paper was bailed in the salvage area and sold offsite.

Refuse collected that was not otherwise reused, recycled, or salvaged was transported offsite and disposed in the "City Incinerator" (Osborn, 1945). There were no onsite disposal areas or landfills noted in the site history information reviewed or in any of the shipyard site plans.

Fitting Dock and Support Buildings

A fitting dock was located along the southern edge of the slip. Once ships were assembled in the ways and launched, they were moored at the fitting dock for outfitting. The fitting operations included installation of

interior features, mechanical and electrical construction, and interior and deck painting. Support buildings included paint storage, mechanical shops, insulation, pipefitting, and electrical shops.

Sandblasting of mill scale from pipe was performed in a small building near the western end of the support buildings. Based on descriptions of the sandblast operations performed at the Swan Island facility during the same period, clean sand was used as sandblast material (Bosn's Whistle, 1945).

Electrical, Water, and Sewer Services

Electrical service was provided by the regional power system through a connection to a Bonneville Power substation near Burgard Road. The power was distributed through several switching stations and substations across the Site. Substations were located at the head of each of the 11 shipways. Although the shipyard transformers were reportedly oil-filled, polychlorinated biphenyls (PCBs) were not yet in wide-spread use during the period of the shipyard operation and would not have been present in the shipyard transformers.

Water was provided to the shipyard through both the public water supply system and through five wells drilled in the southeast area of the Site. A water tank was located at the far eastern edge of the Site near Burgard Road. A second water tank was located at the south end of the Plate Shop. A third water tank was located in the far southeastern corner of the Site, near Well No. 4. This third tank was reported to have a capacity of 200,000 gallons. Water pumped from the on-site wells was treated with chlorine. A chlorine tank was located in the southeast corner of the Site. The five wells were drilled and installed to a depth of about 90 feet in 1944.

Sewage was collected from the buildings and shipways and conveyed to outfalls to the river. Based on the size of the pipe and the relative number of buildings served, the primary sewer discharges appear to have been just north of the slip, and through shipway 7, near the center of the shipyard. Sewage from the barracks and north storage area discharged through an outfall located at the north end of the Site. Figure 2-8 shows the reported shipyard sewer system discharges and layout.

Storm water runoff was collected from paved areas of the shipyard and conveyed to outfalls in the river and in the slip. Figure 2-9 shows the reported storm water system layout for the shipyard.

Acetylene Plants

Acetylene was generated in two acetylene generation plants located on the Site. Acetylene Plant 1 was located along the south side of the slip, just west of the Machine Shop. Acetylene Plant 2 was located just south of the Plate Shop. The acetylene was conveyed across the Site with a series of pipes.

Acetylene was generated at the acetylene generating plants by mixing carbide with water. The reaction produced a lime/water by-product. Based on the facility drawings, the lime/water by-product was contained

in fully contained concrete sumps and was periodically pumped out, presumably for offsite use. There were no reported lime sludge ponds on the Site.

Pontoon Construction

In early 1945, construction of aluminum pontoons was initiated at the shipyard. Portions of the Plate Shop and Assembly Building were modified to accommodate the pontoon construction. The pontoon construction operations included a conveyor system in Bay 1 of the Plate Shop where sheets of aluminum were dipped in a series of tanks for cleaning and painting. The pontoon construction was performed for only a few months before the war ended and the shipyard ceased operations.

Dock Fire

On August 30, 1945, a fire occurred on the outfitting dock. The fire destroyed the dock and the shops along the south side of the dock including the fitting stores, machine shop, and pipe shop. Several ships were damaged and the whirley cranes along the dock fell into the slip as the dock collapsed. The fire was fought using water supplied from the shipyard water supply system and several fire boats.

2.4 Post World War II

2.4.1 Sources of Information

Little direct information is available regarding the activities on the Site after World War II and before Schnitzer ownership (1946 to 1972). Information sources are limited to historical aerial photographs from 1948, 1955, 1956, 1961, 1963, and 1970. Little information was obtained from the City directories available for the site area during this time period.

2.4.2 Site Ownership

A previous environmental assessment report for Boydston Metals notes that Consolidated Freightways purchased the southeast portion of the Site in 1968 (Environmental Management Solutions, 1997). The report does not note who the property was purchased from.

A title history review notes other owners of the Site during this period included the U.S. Surplus Properties Corporation, Beall Pipe and Tank, Louis and Ann Dulien, William and Elizabeth Shenker, Port of Portland, and Broadway Holding Company.

2.4.3 Site Activities and Features

The shipyard ceased operations abruptly and the shipyard buildings generally remained well after the shipyard was abandoned. Buildings that were destroyed in the 1945 shipyard dock fire were not reconstructed.

The barracks present in the northeastern portion of the shipyard were removed between 1948 and 1955. A water tank present during the shipyard operations east of the Plate Shop was removed in the late 1960s.

Few automobiles or other evidence of activities are present around the buildings during this period, especially prior to 1963.

Little evidence of activities is observed in the aerial photographs around any of the buildings or in areas of the Site. The northern (former storage area), north eastern (former barracks), and eastern (former parking lot) areas appear to be vacant and unused in all of the aerial photographs between 1955 and 1967. Some removals of small structures appear to have occurred during this period in the former northern storage area.

The western portion of the former shipyard parking lot area in the eastern portion of the Site was used as a log storage area starting around 1963. The log storage operations increased and the 1972 aerial photograph shows the entire former parking lot area being used for log storage. No activities other than log storage are indicated in this area by the aerial photographs. All but the western portion of the log storage area is east of the Site. In the early 1970s, a drainage ditch was constructed to drain the unpaved log storage area. The ditch flowed from the northwest corner of the area to the northeast corner of the slip.

Based on the aerial photographs, the former shipways remain unchanged from the end of the shipyard operations up to the early 1960s. Starting in the early 1960s, the shipways were filled with what appears to be dredge sand. This filling continued up through the early 1970s and was completed soon after Schnitzer acquired the property. The wooden structures that formed the shipyard were apparently not removed but were filled over with the dredge sand. The former barracks area in the northeast portion of the Site was also filled with dredge sand in the early 1970s. The origin of the dredge sand is not known.

In the early 1950s, the Willamette River shoreline and the slip were used to store log rafts. Some of the aerial photographs from this period note more than half of the slip surface area and the entire length of Willamette River shoreline covered by log rafts. Cargo ships are present in the slip in the 1967 aerial photo. Ships apparently associated with the early Schnitzer recycling operations are present in the slip in the 1972 photograph.

Little information is available regarding the specific businesses that operated on the Site between 1946 and 1972. City directory information does not differentiate between businesses on the Site and businesses operating on the adjacent properties. Based on photographs from near the end of this period and discussions with long-time Schnitzer employees, former businesses on the Site included Beall Pipe and Kerr Grain. Kerr Grain reportedly used the former Plate Shop to store grain. Beall Pipe manufactured steel pipe and tanks in the former Assembly Building. A previous report for the Boydtson Metals references drawings showing Dulien Steel Products Inc. and Owen & McIntyre Electric

Company as businesses that operated in the southeast area during this period.

Based on the general lack of information and the lack of activities indicated by the aerial photograph, no major industrial manufacturing operations are believed to have occurred on the Site during the 1946 – 1972 period.

2.5 Schnitzer Ownership

2.5.1 Sources of Information

The primary sources of information for the period 1972 to the present are historical aerial photographs, site drawings, and interviews with long-time Schnitzer Steel Incorporated (SSI) employees. Information obtained from the employee interviews was generally limited to historical activities and features on the property leased by SSI. Historical information regarding other portions of the Site was obtained primarily from previous reports on the individual parcels.

2.5.2 Site Ownership

SIC purchased the Site property in 1972 from various parties including the Broadway Holding Company. SIC sold the Ryerson property in July 1990. SIC sold the Romar property in December 1994.

2.5.3 Site Features and Activities

Since acquiring the property, SIC has leased portions of the Site to different entities for different operations. Most of the tenant operations have been limited to warehouse operations or light manufacturing.

For the purposes of this report, the historical features and activities on these different portions of the Site during SIC's ownership are described separately. Soil and groundwater sampling and analysis that have been performed on the parcels are also discussed in each section. Figure 2-10 shows the location of these different portions of the Site.

2.5.3.1 Schnitzer Steel Metal Recycling Facility

Features and Operations

SSI began operations on the site in the late 1960s. Initial operations were limited to support of ship scrapping activities performed in the slip. Dredge sand fill was placed in the shipyard shipways in the late 1960s and early 1970s. The filling operations continued after SIC purchased the property in 1972. Filling operations were completed in mid 1970s.

Significant yard operations did not begin until the shear was installed in 1974 near the southern edge of the slip. The automobile shredder was

installed in 1980 and the automobile recycling operations started. SSI did not construct any major buildings for the metal recycling activities and generally used the existing former shipyard buildings. The SSI facilities have always been connected to the city sewer system and water has been supplied by the local water system.

SSI operations have consisted of receiving, processing, and transporting scrap metal. Materials have generally been received by truck, ship, or, occasionally, rail. Received materials have been stored in paved and unpaved areas of the Site until processed. Processing operations have included torch cutting, shearing, and shredding received material into sizes required for reuse. Processing of large materials (i.e. cutting and shearing) has generally occurred in the northern portion of the SSI area, near the slip. The shredder has been located in the southwestern portion of the Site since it was installed in 1980. Processed material has been shipped offsite by ship, rail, or truck.

Automobile Shredder Residue (ASR) has historically been staged immediately north of the shredder since the shredder started operations in 1980. The ASR is the non-metallic material that is a by-product of the automobile shredding process. ASR consists primarily of shredded automobile interior materials, rubber, and plastic. Non-ferrous metals are extracted from the ASR at the shredder as part of the shredder processing. The ASR historically has been loaded into trucks from the staging area and transported to local landfills where it is has been used as alternative daily cover.

SSI recently constructed an indoor ASR processing system in the central portion of the Plate Shop building. The processing system is fully enclosed in the former shipyard Plate Shop building and includes enhanced metal recovery and waste minimization systems. The processed ASR continues to be used beneficially as an alternative daily cover at the Columbia Ridge landfill.

SSI has had a "gate policy" identifying approved and prohibited materials for recycling since the start of operations on the Site. The gate policy strictly prohibits certain materials and requires specific pre-delivery preparations for some items before they can be accepted for recycling (e.g. all fluids must be drained from automobiles before delivery). SSI has excluded PCB-containing materials before PCBs were prohibited by regulations. Incidental batteries received have been placed on spill pallets and temporarily stored inside buildings until they are removed offsite for recycling. Batteries have not been recycled on the Site.

Except for a few select suppliers, the SSI facility has never accepted transformers on the Site. SSI has accepted transformers from selected suppliers only after the transformers are drained, cut, and cleaned. SSI has never processed transformers on the Site.

SSI drilled and constructed a water supply well near the shredder in the southwest portion of the Site in 1979. The well is used for make-up water for the shredder cooling system. The well is about 140 feet deep. In addition, water from the existing OSC shipyard wells is occasionally used for dust-suppression during dry weather.

Two underground storage tanks were previously located in the northeast corner of the SSI area, near the eastern end of the slip. One tank was a 10,000-gallon gasoline tank and one was a 10,000-gallon diesel tank. The tanks were installed prior to 1976. The two underground storage tanks were removed in 1988. According to SSI employees who were present during the tank removal, the tanks were removed by a licensed contractor using the standard of practice at that time and in accordance with applicable regulations. No evidence of contamination was reported during the removal of these tanks in 1988.

SSI constructed about 1000 feet of additional dock along the slip shortly after starting operations on the Site. The SSI operations have included staging and storage of bulk materials from the dock. The bulk materials have included raw materials for SSI's subsidiary's steel mill. All bulk materials have been stored on paved areas in northwest portion of the SSI area.

Pavement has been added to the SSI area over the period of SSI operations. Figure 2-11 shows the progression of pavement areas added by SSI. Pavement present at the end of the shipyard operations was not removed and also remains currently present on the SSI area.

On July 9, 1997 a fire occurred in a stack of crushed automobile bodies that were to be processed through the shredder. The fire was extinguished by the Portland Fire Department using water pumped from the Willamette River. Water used to extinguish the fire was prevented from entering the storm drain system by pumping the ponded water into the shredder cooling water tanks, covering all storm drains in the area around the drainage basin where the water had accumulated, and placing straw bales and absorbent pads around the catch basins. After the fire was extinguished, the catch basins around the fire area were cleaned of debris and all solid debris was cleaned up from the fire area. DEQ visited the site and was satisfied with the actions taken to prevent impact to surface water (Todd, 1997).

Soil and Groundwater Sampling and Analysis

A sediment sample was collected from a storm water catch basin on May 7, 1997 to perform a waste characterization of the sediment for off site disposal. The sample was analyzed for TCLP metals. Only barium (1 mg/L) and chromium (0.33 mg/L) were detected. All other metals were not detected in the TCLP analysis.

The area north of the shredder where the ASR has generally been staged has not been paved. Sampling and analysis of ASR has noted PCBs and lead. Based on an initial evaluation performed by DEQ and ongoing waste analysis conducted by SSI, contaminant concentrations in the ASR are consistently below regulatory levels of concern, and the waste is non-hazardous and is not TSCA-regulated. In addition, the concentrations of lead and PCBs in the ASR have been decreasing since the shredder started operations as use of these materials in manufacturing has been reduced or eliminated and materials containing these substances become less common.

2.5.3.2 Morgan Property

Features and Operations

The Morgan property was originally developed by SIC in 1977 and has been used as a warehouse for storage and distribution of urea and wood products. Between 1972 and 1977, the area was used for log storage.

The current tenant is Morgan CFS No. 2 Company who has used the Morgan property since 1987 for warehousing and consolidating packaging of wood products (primarily particle board) to load into intermodal containers. According to a SIC representative, the building was constructed for Pacific Supply Co-op (Senex) who used the building for bulk storage of urea for about two years. The building was remodeled to accommodate dock-high loading and leased to DHL Container Company who used the building as a depot prior to the time when Morgan CFS moved in. Jefferson Smurfit also has rented space in the building from time to time. No manufacturing activities have been conducted in the Morgan building. There have not been any USTs on the Morgan property.

Soil and Groundwater Sampling and Analysis

Soil and groundwater samples were collected from three Geo-probes on the Morgan property in September 1996 to assess for impacts from the near-by Time Oil property immediately north of the Morgan property. One probe was north of the Morgan building, one to the west, and one to the northwest. One soil sample was collected from each of the borings at 1 foot bgs. The three soil samples were analyzed for pentachlorophenol (PCP) using EPA Method 8270, and all were found to be "nondetect" at a detection limit of 13 µg/kg (CH2MHILL, 1996).

Groundwater samples were collected from each of the three probes and analyzed for PCP using EPA Method 8270, and all were found to be "nondetect" (method reporting level of 0.5 µg/L). No evidence of contamination was observed in any of the soil or groundwater samples (CH2MHILL, 1996).

2.5.3.3 Southeast Area

Features and Operations

The former shipyard salvage building located in this portion of the Site was used by SIC from the late 1970s to 1994 for a truck maintenance and repair shop. The truck maintenance shop was expanded in the early 1980s by extending the building to the east. Maintenance activities included changing oil in trucks and truck repair work. In 1995, this building was leased to Boydston Metal Works who was the building tenant until early 2000. Boydston Metal Works manufactured truck trailers including assembly and painting.

Two concrete tilt-up buildings were constructed in 1978 to the west of the original shipyard salvage building. These buildings were initially used by Metra Steel for steel pipe threading and steel form rolling.

In 1989, Western Machine Works began operations in building located near the center of this portion of the Site. Since that time, Western Machine Works has performed contract metal machine work.

A small building was constructed at the southern edge of this portion of the Site in the early 1990s. This building has been occupied by Portland Blast Media since 1994. Portland Blast media has performed contract sand blast work in enclosed areas in and around the building. Sand blast media was stored on the ground in the southeast corner of this area. Pressure washing and steam cleaning were performed on paved areas east and north of the Portland Blast Media building in the late 1990s. Photographs from 1997 note black staining on the pavement and exterior building walls in the steam cleaning area, immediately east of the Portland Blast Media building (Environmental Management Solutions, 1997).

Based on previous reports (Environmental Management Solutions, 1997) and interviews with SSI employees, two or three underground storage tanks were installed in the southeast portion of the Site in 1980. These tanks consisted of one or two 10,000-gallon diesel tanks and one 10,000-gallon gasoline tank.

SSI employees note that at least five underground storage tanks, including the tanks installed in 1980, were removed from this portion of the Site in 1989. An untitled, undated drawing provided by Schnitzer Steel notes oil, lube oil, hydraulic oil, gasoline, and diesel tanks southeast of the former shipyard salvage building. The age or origin of the removed tanks not installed by SIC in 1980 is unknown. SSI employees did not note an odor or soil staining suggesting soil or groundwater contamination when the tanks were removed.

Four of the five water supply wells installed during the shipyard operations remain on this area of the Site. The fifth well (Shipyard Well No. 4) has been abandoned.

In the early 1980s, the railroad tracks entering the Site in the southeast corner of the Site were abandoned. The property east of the Site, east of Burgard, was then filled raising its elevation significantly higher than the Site. Significant surface water runoff from the property east of the Site onto the Site has occurred since the railroad abandonment and the fill placement.

Soil and Groundwater Sampling and Analyses

Soil and groundwater sampling and analysis were performed in the southeast portion of the Site in late 1997. The sampling scope of work consisted of four test pits and fifteen hand auger holes. Soil samples were collected from each exploration. Groundwater samples were collected from one borehole and an on-site water supply well (Shipyard Well No. 3) located in this portion of the Site. Soil samples were analyzed for petroleum hydrocarbons, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), TCLP metals, and PCBs. A sample of blast media used by Portland Blast Media was also collected and analyzed for TCLP metals.

Petroleum hydrocarbons were not detected in any of the analyzed soil samples. In particular, soil samples were collected from near where the underground storage tanks had been previously removed in 1989. The soil samples were analyzed for petroleum hydrocarbons to assess for possible releases from the underground storage tanks. No petroleum hydrocarbons were detected in the soil samples (Environmental Management Solutions, 1998).

PCBs were detected in two soil samples (15.3 mg/kg and 0.5 mg/kg) collected in the southeast area. The TCLP lead concentration in one soil sample (40 mg/L) exceeded hazardous waste criteria. Low levels (less than 1 mg/kg) of PAHs were detected in two soil samples. Low concentrations (less than 5 µg/L) of TCE and PCE were detected in the groundwater samples. All of the TCLP metal concentrations in the blast media were well less than hazardous waste criteria (Environmental Management Solutions, 1998).

The report concluded that the investigation "...did not detect widespread contamination associated with prior industrial land use of the subject property" (Environmental Management Solutions, 1998). The relatively great distance from the southeast area to the Willamette River, and the essentially insoluble nature of PCBs, the limited area of surface soil with PCBs is not anticipated to pose a threat to the Willamette River.

2.5.3.4 Crown Beverage

Dredge sand was placed as fill material in this area in about 1970. Sometime after 1970 to 1979, the Crown Beverage area was used for log storage. The Crown Beverage building was constructed in 1979 for Walker Manufacturing. Walker used the building to store mufflers and other automobile components. Crown Beverage occupied the building from 1986 to 1999. Crown Beverage used the site for the warehousing of new, empty beer, beverage, and food cans. In July 2000, Boydston Metals occupied the building. Underground storage tanks have not been present in the Crown Beverage area. There were no activities on the Crown Beverage area during SIC's ownership that could have resulted in significant releases of hazardous substances in this area.

2.5.3.5 Portland Container

Features and Operations

After the removal of the shipyard barracks in the late 1940s, the Portland Container area remained vacant until the late 1970s when the area was used for log storage. SSI used portions of the Portland Container area in the 1970s for storage of large steel remnants. SSI did not perform any processing of the remnants in the Portland Container area.

The Portland Container facility was constructed in 1995. Construction of the facility included placement of gravel fill over the area and construction of a small structure. Portland Container uses the area for handling, storage, and maintenance of intermodal containers and intermodal

container chassis. There were no underground storage tanks in the Portland Container area.

The area south of the Portland Container area was used for a log storage yard until the late 1970s. This area drained to the slip through a ditch from the northwest corner of the area to the northeast edge of the slip. This area was filled with dredge sand fill in the late 1970s and the existing Ryerson building constructed. Only the western portion of this area is on the Burgard Industrial Park "Site".

Soil and Groundwater Sampling and Analysis

Soil and groundwater sampling and analyses were performed on the Portland Container portion of the Site in late 1991. The results of the sampling and analysis are presented in a January 22, 1992 report by Environmental Management Solutions. Soil samples were collected from 10 test pits and screened for VOCs with headspace measurements. Selected soil samples were analyzed for petroleum hydrocarbons, VOCs, TCLP metals, and PCBs. Groundwater samples were collected from three of the test pits and analyzed for VOCs.

PCBs were detected in surface soil samples at concentrations up to 20 mg/kg. Diesel petroleum hydrocarbons were also detected in the surface soil samples. PCE was detected in one groundwater sample at a concentration of 5.5 μg/L (Environmental Management Solutions, 1992).

Soil sampling and analysis was also performed on the Portland Container portion of the Site in March 1993 and reported in a March 17, 1993 report by Environmental Management Solutions. Soil samples were collected from 22 test pits and one 6-foot-deep borehole. Four composite and six discrete surface soil samples were also collected. Selected soil samples were analyzed for petroleum hydrocarbons, VOCs, metals, and PCBs. Groundwater samples were collected from three test pits and from the one borehole. The groundwater samples were analyzed for petroleum hydrocarbons, VOCs, and metals.

PCBs were detected in soil samples from one test pit, five surface soil samples, and the one borehole. Detected PCB concentrations ranged from 0.063 mg/kg to 12 mg/kg. All detected petroleum hydrocarbon concentrations were less than 100 mg/kg. VOCs were not detected in the soil samples. Petroleum hydrocarbons, VOC, and PCBs were not detected in the groundwater samples. Metal concentrations in the soil and groundwater samples were consistent with background concentrations (Environmental Management Solutions, 1993a).

Remediation of the PCB-contaminated soil indicated by the soil sampling and analysis was performed in June and July 1994. Prior to the soil remediation work, additional soil samples were collected in June 1994 from the areas where the March 1993 sampling indicated PCB concentrations greater than 1 mg/kg. PCB concentrations up to 19.7 mg/kg were detected in these June 1994 samples (Quality Group, 1994).

Soil remediation consisted of removal of about 50 tons of soil from the previous sample locations where PCB concentrations greater than 1 mg/kg had been measured. The soil was disposed at the Hillsboro

Landfill. PCBs were not detected in the confirmation soil samples collected from bottom and sidewalls of the excavations (Quality Group, 1994).

The location of the soil sample with 20 mg/kg PCBs was found to be on the property north of the Portland Container area (i.e. Romar property). The remediation of this soil is discussed in Section 2.6.2.6.

2.6 History of Surrounding Properties

The following surrounding properties were included in the SHR:

- Union Carbide/Northwest Container
- Port of Portland Terminal 4
- Premier Edible Oil
- Time Oil
- Smurfit
- Romar
- Portland General Electric Substation
- Ryerson Steel
- Northwest Pipe

A summary of the history of these properties is presented below. Figure 1-2 and Figure 1-3 show the location of these surrounding properties.

2.6.1 Sources of Information

The primary sources of information for assessing the history of the surrounding properties was site history summaries prepared for the individual sites by others. Available historical aerial photographs showing the surrounding properties were also reviewed.

2.6.2 Site Features and Activities

2.6.2.1 Union Carbide

Features and Operations

The Union Carbide property was owned by the Oregon-Washington Railroad Company from the early 1900s to 1942. Union Carbide purchased the property in 1942 and constructed and operated a calcium carbide and ferroalloy processing facility. Raw materials handled at the facility included ore, slag, petroleum coke, and bituminous coke.

In the mid 1950s, a wet scrubber system was added to the facility's furnaces, coke dryer, and baghouse for air pollution control. Sludge

produced by the wet scrubber system was discharged to two, unlined ponds located north of Columbia Boulevard. Discharge pipes from the ponds to the Columbia slough were constructed in the mid 1970s. A third pond of unknown use was constructed in the eastern portion of the property in the 1970s. The Union Carbide operations included the main processing building and a substation on the western edge of the property, adjacent to the Site.

Union Carbide ceased operations in 1981 and sold the property to Elkem who then sold the property to Gilmore Steel/Oregon Steel. Oregon Steel leased the property for container storage and did not perform any manufacturing activities. Oregon Steel sold the western portion of the property to WMR in 1997. WMR continues to use the property for container storage.

Soil and Groundwater Sampling and Analysis

Most of the soil and groundwater investigations performed on the Union Carbide property have been focused on the area around the former sludge ponds, on the eastern edge of the property, adjacent to the Columbia Slough. In 1995, Hart Crowser performed soil and groundwater sampling on the western portion of the property for Oregon Steel. Hart Crowser's assessment noted petroleum hydrocarbons in soil samples above cleanup levels near the former underground storage tanks and in surface soils. Low (less than drinking water levels) concentrations of VOCs were detected in groundwater samples from along the southern edge of the property. PCBs were detected in soil samples from around the former electrical substation in the northwest corner of the property.

In 1998 and 1999, Hart Crowser performed remediation activities at the former electrical substation and underground storage tank locations. Approximately 580 tons of soil were removed from the former underground storage tank locations and about 97 tons of PCB-contaminated concrete and 437 tons of PCB-contaminated soil were removed from the former substation area. DEQ has concurred with the underground storage tank and substation soil remediation activities.

In January 2000, Union Carbide and Elkem entered into a Consent Order with DEQ to perform a Remedial Investigation and Feasibility Study (RI/FS). Union Carbide has recently submitted a draft RI/FS Work Plan to DEQ for review (Union Carbide, 2000).

2.6.2.2 Port of Portland Terminal 4

Features and Operations

The City of Portland Commission of Public Docks (Public Dock Commission) purchased the Terminal 4 property from the Union Pacific Railroad (UPRR) in 1917. Shortly after, Public Dock Commission constructed Pier 1 and Pier 2, south of the Site. Slip 1 of Terminal 4 serves Pier 1 and Pier 2. Rail lines served the piers starting prior to 1936 (Hart Crowser, 2000).

A 1936 aerial photograph notes that the piers are the only development present around the southern and eastern edge of the Site. Piers 1 and 2 consisted of warehouses and dry goods storage terminals. A restaurant and administration building was also located at Piers 1 and 2. A series of small above-ground tanks are present at the head of Slip 1 starting before 1940 and are still present currently. Although the past use of these tanks is not known, the tanks are currently used for agricultural chemicals (Hart Crowser, 2000).

Between 1948 and 1956, grain storage silos were constructed along the northern edge of Terminal 4 (just south of the southern edge of the Site). The grain silos are still present on the Terminal 4 property. Other products handled on the overall Terminal 4 area include lumber, logs, dry and liquid bulk products, and steel products (Hart Crowser, 2000).

Petroleum above ground storage tanks, underground storage tanks, and underground pipelines have been located on the Terminal 4 property. A UPRR underground pipeline dating back to the early 1900s was located near Slip 3. The pipeline was used to transfer diesel and Bunker C oil from a UPRR above-ground storage tanks located west of the Terminal 4 property. A Quaker State Oil oil packaging facility, including above-ground storage tanks and an underground pipeline was also located at Slip 3 between 1953 and 1985 (Hart Crowser, 2000). Three underground storage tanks were previously located near Slip 3. All of the underground storage tanks have been removed (Hart Crowser, 2000).

Soil and Groundwater Sampling and Analysis

Releases of petroleum hydrocarbons have occurred from the tanks and pipelines. Extensive soil, groundwater, and sediment sampling has been performed at the Terminal 4 Slip 3 area to assess then nature and extent of contamination. Releases have included petroleum hydrocarbons from the UPRR pipeline, petroleum hydrocarbons from the underground storage tanks, and pencil pitch to the sediments. Free product is present on the shallow groundwater and petroleum seeps are present along the Willamette River shoreline of Slip 3. Chlorinated VOCs have also been detected in soil samples from around the former underground storage tanks (Hart Crowser, 2000).

The Port of Portland is currently performing an RI/FS on the Slip 3 portion of the Terminal 4 property under the DEQ voluntary cleanup program.

2.6.2.3 Premier Edible Oil

Features and Operations

Prior to 1941, the Premier Edible Oil property was vacant, undeveloped marsh land.

In early 1941, Northwest Oil Company (a predecessor to Time Oil) moved seven above-ground storage tanks from what is now the southern edge of the slip (i.e. northwestern edge of the Site) to the Premier Edible Oil property. A dock, apparently used to transfer product from ships to the tanks was also present. Based on title report information, the Premier

Edible Oil property was owned by Northwest Oil Company during the period when the tanks and dock were present.

In late 1943, the Northwest Oil Company tanks were moved further north to the current location of Time Oil. Based on the reported practices used when the tanks were moved from the Site to Premier Edible Oil property in 1941 (Section 2.3.3.1), oil stored in the tanks was likely drained on to the ground prior to the tanks being moved.

From 1943 to late 1945, the Premier Edible Oil property was used by the OSC shipyard to store products and materials. Shipyard facilities that were present on the property during this period consisted of the Paint Storage, Cable Storage, Boiler Erection, Firebrick Storage, and Coke Storage buildings. A loading dock was along the northern edge of the slip adjacent to the Premier Edible Oil property during the shipyard operations.

Based on the available historical aerial photographs, little activity occurred on the Premier Edible Oil property between 1946 and 1972. The southern half of the Paint Storage Building appears to have been demolished in the early 1960s. The Boiler Erection and Firebrick storage buildings were removed in the late 1960s or early 1970s.

SIC purchased the Premier Edible Oil property in 1972. SIC leased the property to Premier Edible Oil in 1973 and Premier Edible Oil constructed an edible oil processing and storage facility. The facility included an above-ground tank used to store diesel oil. The diesel oil was used in facility boilers that were used to heat the oil. The Premier Edible Oil operations also included general maintenance including cleaning of oil processing, handling, and storage equipment.

Premier Edible Oil also constructed a dock on the Willamette River. The dock was used to transfer edible oil between ships and the facility. Storm water outfalls from the Premier Edible Oil facility discharged to the Willamette River.

Premier Edible Oil obtained a wastewater discharge permit from the City of Portland Bureau of Environmental Services (BES) in 1992. BES noted that Premier Edible Oil had permit violations for Oil & Grease and pH. The permit was terminated in July 1996.

Premier Edible Oil ceased operations on the property in January 1997. In January 1997, the property was occupied by Quincy Foods. Quincy did not operate on the property and Quincy vacated the property in May 1998.

SIC has never occupied or operated on the Premier Edible Oil property.

Soil and Groundwater Sampling and Analysis

Soil and groundwater sampling has been performed on the Edible Oil property. AGRA performed soil and groundwater sampling for Premier Edible Oil in 1996. AGRA detected VOCs, polycyclic aromatic hydrocarbons (PAHs), and petroleum hydrocarbons in the soil and groundwater.

Bridgewater Group performed soil and groundwater sampling at the Premier Edible Oil facility in 1998, as well as subsequent soil sampling during trenching activities. Bridgewater Group documented the presence of gasoline-range hydrocarbons, diesel-range hydrocarbons, volatile organic compounds, and edible oil (identified as oil & grease) in soil and groundwater. The petroleum hydrocarbons and edible oil were primarily detected in groundwater in the central portion of the property near the processing area and southeastern tank farm. Volatile organic compounds associated with gasoline range hydrocarbons were detected in groundwater. Trichloroethene was detected in groundwater adjacent to the maintenance building (Bridgewater Group, 1998).

A multi-foot layer of floating hydrocarbons, gasoline and diesel range hydrocarbons, and volatile organic compounds was also measured in the southern portion of the property (MW-2), west of the former OSC warehouse building (Bridgewater Group, 1998). Monitoring well MW-2 is located west of the former warehouse building and is also in the location of the former Northwest Oil Company tank farm.

Because Northwest Oil (Time Oil) and Edible Oil were the sole operators and occupants of the property, SIC does not have access to specific operating and waste management records for these operators/occupants. Thus, SIC has not been able to identify all potential source areas of concern at the property nor has SIC been able to thoroughly connect the existing information to potential source areas.

2.6.2.4 Time Oil

Features and Operations

Prior to 1943, the Time Oil property was vacant and undeveloped and consisted of low-lying marsh lands. In 1943, Northwest Oil Company moved their above-ground storage tanks from the Premier Edible Oil property (Section 2.6.2.3) to the western portion of the Time Oil property. This "west tank farm" and some support buildings located east of the tank farm were the initial portions of the Time Oil facility constructed. The eastern portion of the Time Oil property was used by the shipyard to store raw materials until the shipyard ceased operations in late 1945.

A second tank farm, known as the Bell Terminal, was constructed in the early 1950s immediately east of the Premier Edible Oil property. Time Oil purchased the Bell Terminal in 1953. Time Oil continues to operate the two tank farms and associated support buildings. The eastern area of the Time Oil site has been vacant since the shipyard ceased operations.

From 1967 to 1982, pentachlorophenol (PCP) products were formulated at the Time Oil facility, east of the west tank farm. From 1975 to 1989, Time Oil allowed Crosby and Overton to use two tanks to store waste liquids generate during offsite cleanup projects (Landau, 1996).

Soil and Groundwater Sampling and Analysis

Soil and groundwater sampling and analysis have documented the release of petroleum hydrocarbons, PCP, dioxin, and PCBs on the Time Oil property.

Although some soil removal has been performed on the Time Oil property, recent soil sampling and analysis has noted the following soil contaminant concentrations (Landau, 2000):

- PCP up to 500 mg/kg
- PAHs up to 27 mg/kg
- PCBs up to 16 mg/kg
- Dioxins and furans up to 0.0051 mg/kg
- Diesel hydrocarbons up to 5100 mg/kg
- Priority pollutant metals at elevated concentrations

Numerous groundwater investigations have been performed on the Time Oil property and over 20 groundwater monitoring wells have been installed. Quarterly groundwater sampling and analysis has been performed since March 1997. Contaminant concentrations detected in the shallow groundwater at the Time Oil property are summarized as follows (Landau, 2000):

- PCP up to 24,000 µg/L
- VOCs up to 4,000 µg/L
- Naphthalene up to 120 µg/L
- Chromium and lead up to 42 µg/L
- Dioxins and furans up to 0.00189 µg/L
- Diesel hydrocarbons up to 14,000 µg/L

Contaminants were also detected in the deep groundwater zone.

Time Oil is currently performing an RI/FS under the DEQ voluntary cleanup program. As an interim action under the RI/FS, Time Oil is currently designing a groundwater extraction system that is intended to prevent PCP contaminated groundwater from migrating off of the property to the south or to the west, to the Willamette River.

2.6.2.5 Smurfit

Prior to 1943, the Smurfit property was vacant, undeveloped, and consisted of low-lying marsh land. In 1943, a 200-ft by 100-ft building was constructed for the OSC shipyard. During the shipyard operations, the building was used as the primary warehouse for the shipyard. A dock in the slip was also present along the southern edge of the Smurfit property during the shipyard operations.

No significant changes to the property or building are apparent on the historical aerial photographs between the end of the shipyard operations

in late 1945 and the current property and building configuration. The specific operations on the property after the shipyard ceased operations and the 1980s is not known. No evidence of heavy manufacturing activities is present on the aerial photographs during this time period. The property may have been used during this period to manufacture paper containers (DEQ, 1999). SIC has never owned or operated on the Smurfit property.

In 1986, Jefferson Smurfit Corporation (JSC) purchased the property and started constructing corrugated containers. JSC operations included a 14,200 gallon above-ground storage tank containing Bunker C oil. The tank was heated to allow pumping of the oil through piping. The tank was removed in 1997 and replaced with a new 6,000-gallon above-ground tank.

In 1997, a release of about 100 gallons of oil occurred from the tank heating system. Previous releases were found to have also occurred. About 650 tons of petroleum-contaminated soil were removed and disposed offsite. Confirmation soil samples collected after the removal noted about 1 cubic yard of soil with 2500 mg/kg petroleum hydrocarbons remaining under a rail track (DEQ, 1999).

JSC has a storm water permit. Monitoring performed under the permit in 1998 noted 19 mg/L oil and grease in the storm water runoff (DEQ, 1999). The storm water runoff from the Smurfit property flows to the adjacent slip.

2.6.2.6 Romar

Features and Operations

Prior to 1943, the Romar property was vacant, undeveloped, and consisted of low-lying marsh lands. In 1943, barracks for the OSC shipyard were constructed on the property. After the shipyard ceased operations in late 1945, the barracks were abandoned. The barrack structures were removed in the late 1940s and the property remained vacant until 1994. SIC purchased the Romar property in 1972.

In 1994, SIC sold the Romar property to Romar who constructed an approximately 75,000 square-foot building. Romar continues to use the building as a general warehouse. No manufacturing has occurred on the Romar property.

Soil and Groundwater Sampling and Analysis

Numerous soil investigations were performed on the Romar property in 1992 and 1993 (Environmental Management Solutions, 1993), (Technical Action Group, 1993a), (Environmental Management Solutions, 1992), (Quality Group, 1993), (Technical Action Group, 1993b). Surface and near surface soil sample analyses included photoionization field measurement surveys and laboratory analysis for VOCs, metals, and PCBs. Low levels of petroleum hydrocarbon contamination were detected in a few samples that were coincident with elevated concentrations of

PCBs (see below). VOCs and elevated concentrations of metals were not observed.

PCBs were measured in soil samples from the upper 2 feet at concentrations up to 20 mg/kg on the Romar property. Remediation of the PCB-contaminated soil was performed in 1993. The soil remediation consisted of excavation and offsite disposal of soil from the upper 2 to 4 feet of soil in the areas where samples with PCB concentrations greater than 1 mg/kg had been collected. Confirmation soil samples collected after the soil remediation noted PCBs concentrations ranging from non-detected to 0.12 mg/kg. Petroleum hydrocarbons were detected at concentrations of 7 mg/kg in the single confirmation sample in which PCBs were detected.

Additional surface soil samples were collected from the Romar site in late 1993. Thirteen soil samples were collected at statistically selected, random locations across the eastern and southern portions of the property and analyzed for PCBs. PCBs were detected in 6 of the 13 samples with a maximum measured concentration of 1.5 mg/kg. Of the six samples that had detected concentrations of PCBs, only one sample had a PCB concentration greater than 1 mg/kg. All of the PCB concentrations are well less than the current DEQ Generic PCB cleanup level of 7.5 mg/kg for industrial property.

2.6.2.7 Portland General Electric Substation

A Portland General Electric (PGE) substation has been present east of the northeast corner of the Site starting near the time the OSC shipyard were constructed in 1943. Up until 1968, one substation was located about 700 feet north of the Site. In 1968, a second substation was constructed immediately north of the Site.

2.6.2.8 Ryerson Steel

Prior to 1941, the Ryerson property was vacant, undeveloped, and consisted of low-lying marsh lands. In early 1941, the Ryerson property was filled and used as a parking lot for the OSC shipyard. The parking lot surface was graveled.

After shipyard operations ceased in late 1945, the Ryerson property remained vacant and undeveloped until the mid to late 1960s when the property was used for log storage. The log storage operations continued until about 1980 when the property was filled with dredge sand and the currently existing Ryerson building was constructed. Aerial photographs from the late 1970s show an apparent ditch draining storm water runoff from the western end of the Ryerson property to the head of the slip. Storm water runoff from the Ryerson property continued to drain to the slip after the site was developed for the Ryerson building.

Since starting operations on the site, Ryerson has distributed structural steel products. On site activities have consisted primarily of cutting steel members to customer-specified dimensions.

In March 1999, Ryerson received a request for information from DEQ regarding past and current environmental conditions and actions that their facility. Ryerson did not respond to DEQ's request and DEQ has not taken any further action.

The Northwest Pipe office building and a building used by Dunkin Bush, a painting contractor are located at the far southern edge of the Romar property. The Northwest Pipe building was originally constructed as the personnel building for the OSC shipyard.

2.6.2.9 Northwest Pipe

Features and Operations

Prior to early 1941, the Northwest Pipe property was vacant, undeveloped, and consisted of low-lying marsh land.

In early 1943, the OSC shipyard was constructed on and around the Northwest Pipe property. In particular, the Assembly Building was constructed on the Northwest Pipe property. The Assembly Building and the operations performed in the building are described in Section 2.3.3.2.

According to Northwest Pipe, the property was owned by Beall Pipe from soon after the shipyard ceased operations to 1983. Beall Pipe manufactured steel pipe (Northwest Pipe, 1999). SIC has never owned or operated on the Northwest Pipe property.

A 1961 aerial photograph shows the former shipyard Assembly Building (i.e. Beall Pipe building) being remodeled. A 1963 photograph shows the reconfigured building which is somewhat smaller than the original Assembly Building. After 1963, aerial photographs note more automobiles and signs of activities around the former Assembly Building, presumably associated with the reconstruction of the building.

Northwest Pipe purchased the property in 1983 from Beall Pipe and continued the large-diameter pipe manufacturing operations. Pipe manufacturing operations on the Northwest Pipe property have included pipe coating with coal tar and pipe painting.

A 1,000-gallon gasoline underground storage tank was located in the northeastern portion of the property. The tank was removed in March 1989.

A water supply well is located near the northwestern corner of the main building on the Northwest Pipe property.

Soil and Groundwater Sampling and Analysis

EPA performed a hazardous waste inspection at the Northwest Pipe facility in July 1986. The inspection noted 30 drums of accumulated hazardous waste, some with no lids. The inspection also noted an apparent diesel stained area on the surface soil.

EPA performed a TSCA inspection at the Northwest Pipe facility in August 1986. Soil samples were collected during the inspection and

analyzed for PCBs. PCB concentrations up to 27 mg/kg were measured in the soil samples.

Dames & Moore performed an environmental site assessment on the Northwest Pipe property in 1988. The assessment noted several areas of concern regarding soil and groundwater contamination. These included:

- Up to 58,000 mg/kg petroleum hydrocarbons in soil around above ground storage tanks.
- Soil with up to 31 mg/kg PCBs around electrical transformers
- Storm drain sediment with 3,300 mg/kg petroleum hydrocarbons and over 40 mg/kg PAHs.

In December 1988, Northwest Pipe entered into a Letter Agreement with DEQ for oversight of site cleanup activities. In April 1990, Northwest Pipe performed soil remediation at the underground storage tank site. About 300 cubic yards of soil were removed. Soil with up to 3,100 mg/kg petroleum hydrocarbons remained after the soil removal was completed. Four groundwater monitoring wells were subsequently installed in the underground storage tanks area and sampled for benzene, toluene, ethylbenzene, and xylene (BTEX). Although initial groundwater sampling noted elevated concentrations of BTEX, a subsequent sampling did not note BTEX concentrations greater than drinking water levels. DEQ provided a "No Further Action" determination for the underground storage tank in 1990.

Northwest Pipe excavated about 1,600 cubic yards of soil noted in the 1988 Dames & Moore study. The soil was stockpiled on the Northwest Pipe property for about 2 years before it was disposed at the Hillsboro Landfill. Sampling of the stockpiled soil prior to offsite disposal noted over 5 mg/kg of TCE, over 15 mg/kg PAHs, and up to 320 mg/kg petroleum hydrocarbons. Crosby and Overton performed the remediation and prepared a summary report. A September 1991 DEQ memorandum notes that the removal work was not "...well documented" and that "...significant contaminant concentration levels were detected" in areas where no cleanup was performed. The memorandum also noted that Crosby and Overton sometimes did not sample for the contaminant for which the removal work was performed.

According to Northwest Pipe's April 9, 1999 response to DEQ request for site information, no soil or groundwater sampling or analysis has been performed on the property since the 1989-1991 work.

The October 26, 1999 DEQ Strategy Recommendation for the Northwest Pipe property notes that tetrachloroethylene, fluoranthene, and petroleum hydrocarbons have been detected in a water sample from the on-site water production well (DEQ, 1999b).

SECTION 3

FEATURES OF CONCERN IDENTIFIED FROM SITE HISTORY REVIEW

The site history information presented above suggests five "Features of Concern" or FOCs. The FOCs are areas or features where the site history review indicates that there was a release or a potential release of hazardous substances and that such a release, if it occurred, could pose a threat to human health or the environment. Based on the site history information presented above, the following FOCs were identified:

- Former Northwest Oil Company oil tanks
- Former shipyard sanitary sewer and storm water discharges
- Former shipyard shipways
- ASR on ground surface
- Southeast area

The basis for considering each of these a FOC is discussed below.

Each of these FOCs will be further assessed to determine whether releases have occurred from these FOCs and, if releases have occurred, if hazardous substances have migrated from the Site to the Willamette River.

3.1 Former Northwest Oil Company Tanks

Releases of oil were reported to have occurred from the former Northwest Oil Company tanks in early 1943. As discussed in Section 2.2.3 and Section 2.3.3.1, the tanks were previously located in the northwest corner of the SSI portion of the Site from 1939 to 1941. The oil was drained from the tanks before the tanks were moved to the north edge of the slip. A "pond of oil" formed from the draining of the tanks.

Based on the former presence of the tanks, the reported release of oil from the tanks, and close proximity of the tanks to the Willamette River and the slip, the area of the former tanks should be further assessed for the potential presence of contamination and possible associated migration pathways to the nearby Willamette River and slip. Although the area of the tanks is currently filled with over 10 feet of fill, subsurface contamination could possibly be an ongoing source of contamination to the Willamette River through groundwater migration.

Contaminants of interest (COIs) associated with the former Northwest Oil Company tanks would be petroleum hydrocarbons and, in particular, PAHs.

3.2 Former Shipyard Sanitary Sewer and Storm Water Discharges

As discussed in Section 2.3.3.2 and shown in Figure 2-8 and Figure 2-9, the shipyard sanitary and storm water drain systems discharged to the Willamette River. Wastes from the shipyard facilities and runoff from the paved areas of the shipyard would have been discharged to the river at the points noted on the Figures. Given the activities that were performed on the shipyard, including metal machining and painting, wastes containing hazardous substances may have been discharged to the river through the sanitary sewer. Given the storage of hazardous substances including oil, solvents, and paint in paved storage areas and the likely incidental spillage of products onto the pavement, storm water runoff from these areas to the river may have included hazardous substances.

The sanitary sewer and storm drain discharge points are currently located beneath over 10 feet fill and approximately 200 to 300 feet from the current edge of the Willamette River. The COIs associated with the shipyard sanitary sewer and storm drain discharges would include the hazardous substances used at the shipyard. Particular COIs would be petroleum hydrocarbons, VOCs, PAHs, and metals. PCBs would not be a COI because PCBs were not in common use in the early 1940s when the shipyard was operating.

3.3 Former Shipyard Shipways

Once the ships were assembled in the shipways, the ships' hulls were painted with several coats of paint. Paint was likely oil-based paint. The exterior coats of paint consisted of "anti-corrosive" paint with a final coat of "anti-fouling" paint. Lead-based paint (i.e. "Red Lead") was used on some interior and top deck surfaces.

The paint was applied to the exterior of the ship from scaffolding with no apparent provisions to prevent spillage to the shipway floor or underlying ground surface. Although available photographs from early in the shipyard operations note relatively clean shipway floors (Figure 2-6), some spillage and drips of paint to the floors and underlying ground surface likely occurred.

The shipways are currently covered with over 10 feet of dredge sand fill. Hazardous substances possibly released in the shipways during the shipyard operations may still be present and could be an ongoing source of hazardous substances to the Willamette River through groundwater migration.

COIs associated with possible historical releases in the shipways are those associated with the paints used on the ships. In particular, VOCs would be the primary COIs associated with the possible shipway releases. Metals typically used in anti-fouling paint (i.e. copper, chromium) would also be COIs. Given the reported use of lead-based

paint, lead would be a COI. Because tributyl tin (TBT) was not in use during the operations of the shipyard, the "anti-fouling" coat would not have contained TBT and TBT is not a COI associated with possible releases from the shipways.

3.4 ASR on Ground Surface

As discussed in Section 2.5.3.1, some ASR has been staged periodically on bare ground since the beginning of the shredder operations in 1980. Although the ASR has been determined to be non-hazardous and not TSCA regulated, sampling and analysis of the ASR has noted low levels of hazardous substances in the ASR. The long-term presence of the ASR on the ground surface may have resulted in releases of the hazardous substances to the underlying soil.

Hazardous substances possibly released to the soil from the ASR may possibly migrate to the Willamette River through runoff of surface water or, less likely, through groundwater migration.

COIs associated with the ASR are PCBs and lead. Given the relative insolubility of these substances, they are anticipated to be essentially immobile and have likely not migrated past the upper few feet of soil in the immediate area of the ASR staging area. Any migration with the storm water would likely be associated with particulates in the storm water. Further assessment of the ASR storage area should be performed to confirm that lack of migration or possible associated releases to the Willamette River or slip.

3.5 Southeast Area

As discussed in Section 2.5.3.3, low concentrations of PCBs and lead have been detected in the surface soil in the southeast area. Given the relative insolubility of these substances, they are anticipated to be essentially immobile and have likely not migrated past the upper few feet of soil in the southeast area. Any migration with the storm water would likely be associated with particulates in the storm water. In general, given the relatively far distance from the southeast area to the Willamette River, it is unlikely that PCBs or lead have migrated from the southeast area to the Willamette River. Further assessment of the PCBs and lead in the surface soil should be performed to confirm the lack of migration or possible releases to the Willamette River or slip.

Although oil staining has been observed on the pavement and buildings in the area around the Portland Blast Media building, petroleum hydrocarbons were not detected in soil samples collected from the southeast area in 1997. These sampling and analysis results indicate that petroleum hydrocarbons have not been released from the steam cleaning and pressure washing areas to the nearby surface soil. The 1997 sampling and analysis also did not detect petroleum hydrocarbons in soil

samples collected from near where the underground storage tanks had been removed (Environmental Management Solutions, 1998). Based on the above, petroleum hydrocarbons are not a COI in the southeast area.

SECTION 4

REFERENCES

The following references were used in the preparation of this site history report:

- Bosn's Whistle, 1945. Publication of the Oregon Shipbuilding Corporation, various issues from 1945, obtained from the Oregon Historical Society.
- Bridgewater Group, 1998. *Summary Report, Focused Site Characterization for 10400 N. Burgard Way,* September 1998.
- CH2M HILL, 1996. *Environmental Site Assessment for Morgan CFS, 9445 North Burgard Way, Portland, Oregon*, October 8, 1996.
- DEQ, 1999a. *DEQ Site Strategy Assessment Program – Strategy Recommendation, Jefferson Smurfit Corporation*, October 26, 1999.
- DEQ, 1999b. *DEQ Strategy Recommendation, Northwest Pipe*, October 26, 1999.
- EDR, 2000. Environmental Data Resources, Inc., aerial photographs from 1955, 1963, 1970, 1994, obtained August 2000.
- Environmental Management Solutions, 1992. *Field Sampling Report for IT Terminal Property*, January 22, 1992.
- Environmental Management Solutions, 1993a. *Expanded Environmental Site Assessment and Sampling Study of the IT Terminal Property Lots 1, 2, 3, & 4.* March 17, 1993.
- Environmental Management Solutions, 1993b. *Expanded Environmental Site Assessment and Gross Indicators Sampling Study of IT Terminal Property Lot 8*, May 27, 1993.
- Environmental Management Solutions, 1997. *Level I Environmental Site Assessment of Real Property Located in Parcel 2 of the Burgard Industrial Park in Portland, Oregon,* November 3, 1997.
- Environmental Management Solutions, 1998. *Level II Environmental Sampling Study of Parcel 2 in the Burgard Industrial Park in Portland, OR,* January 20, 1998.
- Hart Crowser, Inc., 2000. *Volume 1, Remedial Investigation Report, Terminal 4, Slip 3 Upland, Port of Portland, Portland, Oregon*, January 21, 2000.
- Landau, 1996. *Work Plan, Phases I and II, Remedial Investigation/Feasibility Study, Time Oil Co. Northwest Terminal*, May 10, 1996.
- Landau, 2000. *Draft Report – Volume I of II, Phase II Remedial Investigation Report, Time Oil Co. Northwest Terminal*, April 6, 2000.

- Northwest Pipe, 1999. *DEQ Site Assessment Review ECSI ID #138*, April 26, 1999.
- Oregon Shipbuilding Corporation, *General Arrangement of Shipyard*, drawing dated December 14, 1944.
- Oregon Shipbuilding Corporation, Portland, Oregon, *Facilities Progress Report*, July 15, 1942.
- Osborn, 1945. *Oregonship, A Story of a Shipyard – Its Beginning and Development from the Year 1941 through 1945*, Oregon Shipbuilding Corporation, Julia Osborn, 1945. Obtained from Oregon Historical Society.
- Quality Group, 1993. *Phase II Environmental Site Assessment, Sampling and Analysis of the Schnitzer Investment Corp. Property, International Terminals Site, Portland, Oregon*, November 24, 1993.
- Quality Group, 1994. *Interim Phase II and Phase III Environmental Site Assessment, Soil Sampling and Excavation, Parcels 4, 5, & 6 International Terminals Property*, August 19, 1994.
- Reference Drawings, Oregon Shipbuilding Corporation, Portland, Oregon, various dates in 1944 and 1945
- Technical Action Group, 1993a. *Technical Review and Sampling Study of Schnitzer Investment Corporation Property At International Terminals Site in Portland, Oregon*, June 14, 1993b.
- Technical Action Group, 1993b. *Technical Review and Sampling Study of Schnitzer Investment Corporation Property At International Terminals Site in Portland, Oregon*, July 27, 1993.
- Todd, 1997. July 9, 1997, *Car Fire – International Terminals*, July 21, 1997.
- Union Carbide, 2000. *Draft Remedial Investigation Work Plan, Union Carbide/Elkem Site*, May 15, 2000.
- USCE, 2000. U.S. Army Corps of Engineers, Portland Division, aerial photographs from 1936, 1940, 1944, 1948, 1956, 1961, 1963, 1967, 1972, 1977, 1980, 1983, 1986, 1991, 1998, obtained July 2000.
- War Assets Administration, *Availability and Disposal Information, Shipyard: Known as Oregon Shipbuilding Corp. Shipyard*, Portland, Oregon.

FIGURES

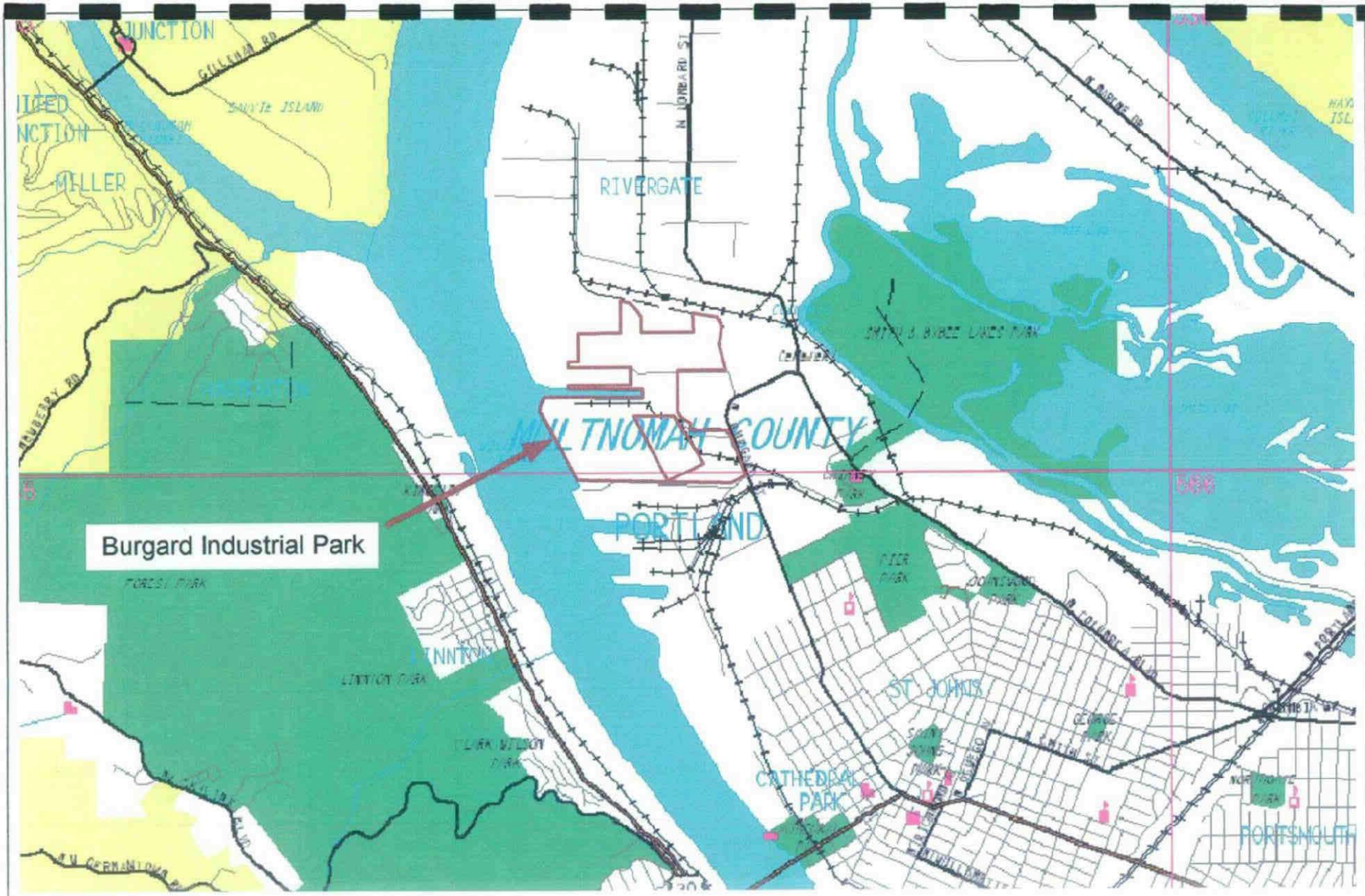


Figure 1-1
Site Location Map
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

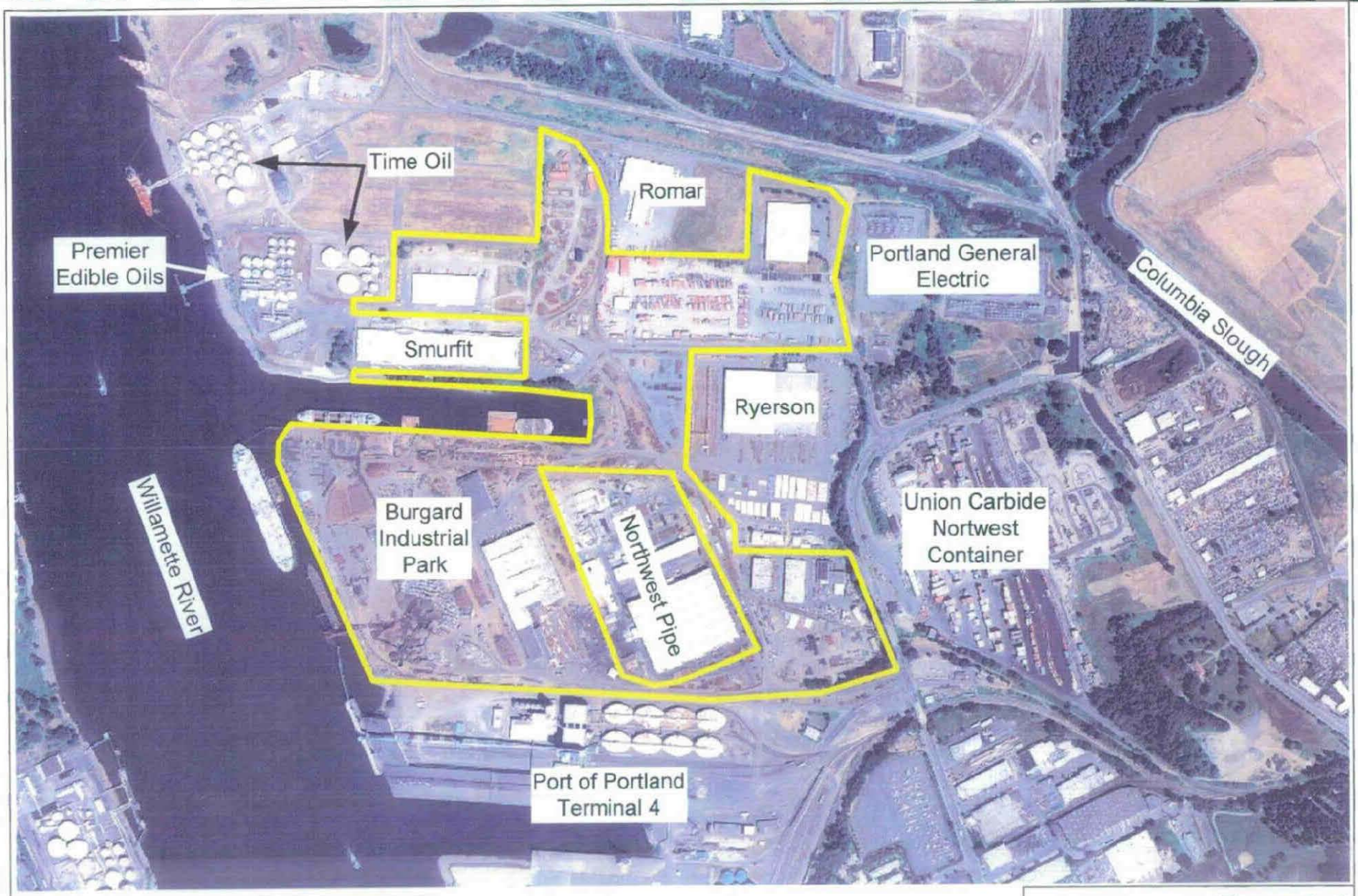


Figure 1- 2
1998 Aerial Photograph
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

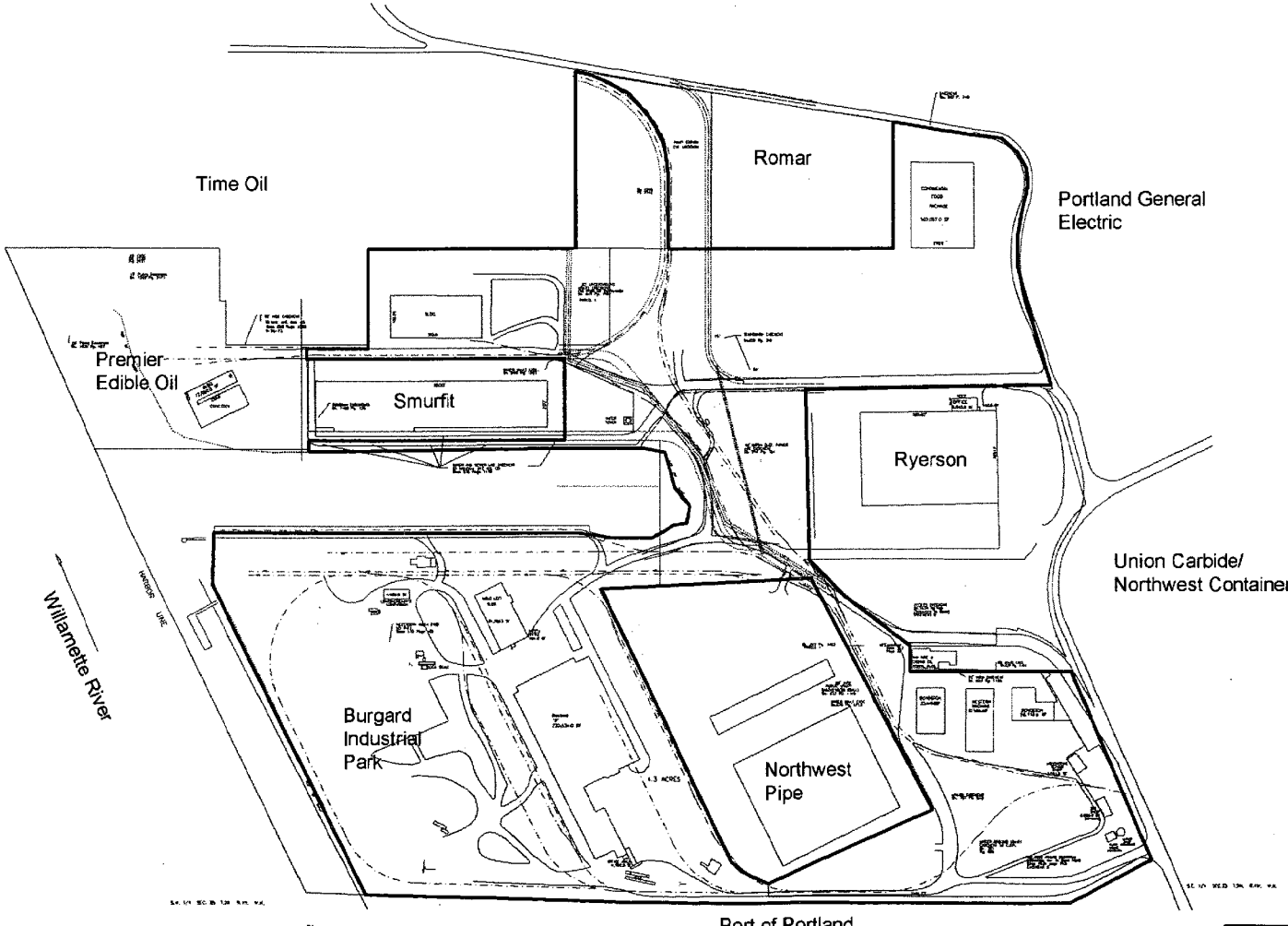
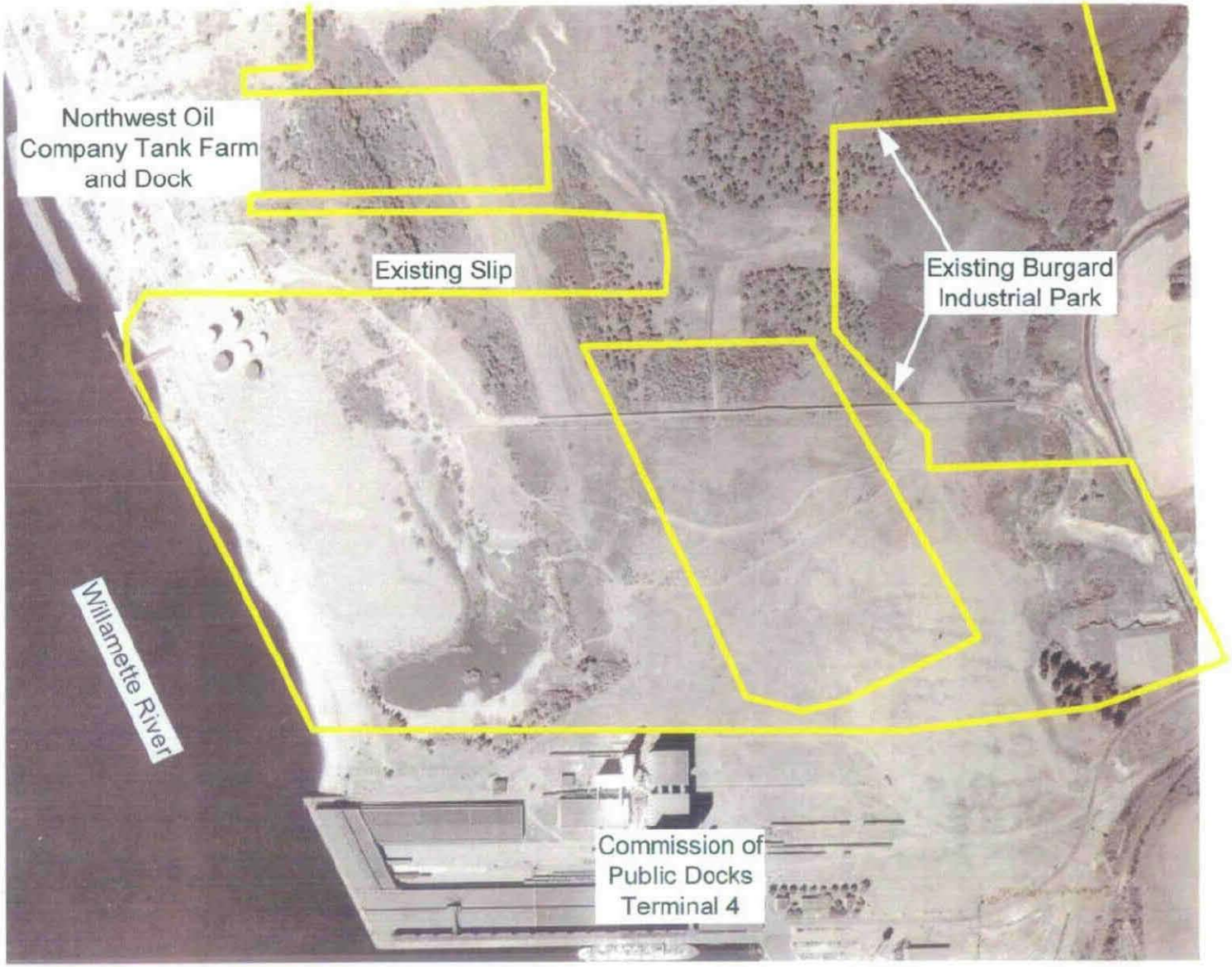


Figure 1-3
Site Plan
Burgard Industrial Park

Bridgewater Group, Inc.



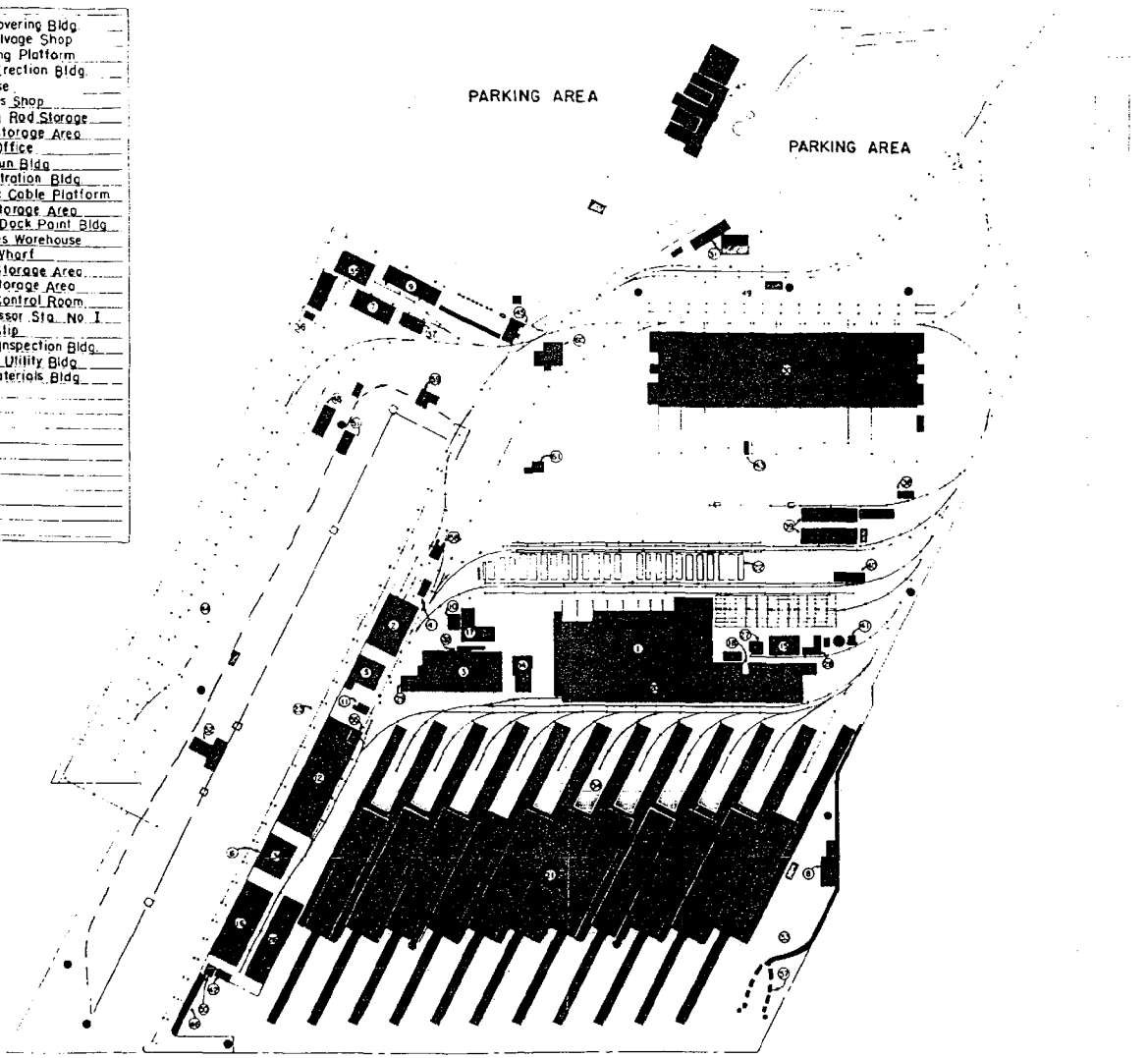
Approximate Scale

590 Feet

Figure 2-1
1940 Aerial Photograph
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

1	Plate Shop	37	Deck Covering Bldg.
2	Machine Shop	38	Bolt Salvage Shop
3	Mold Loft	39	Unloading Platform
4	Blacksmith Shop	40	Boiler Erection Bldg.
5	Dock Pipe Shop	41	Oil House
6	Electrical Shop	42	Asbestos Shop
7	Sheet Metal Shop	43	Welding Rod Storage
8	Carpenter Shop	44	North Storage Area
9	Rigging Loft	45	Guard Office
10	Oxygen Storage	46	Trial Run Bldg.
11	Acetylene Bldg. No. I	47	Administration Bldg.
12	General Stores	48	Electric Cable Platform
14	Field Office	49	East Storage Area
15	South Point Storage Bldg.	50	Fitting Dock Point Bldg.
16	Fitting Stores	51	Facilities Warehouse
17	Safety Building & Hosp.	52	North Wharf
18	Substations	53	South Storage Area
60	General Stores Annex	54	Ways Storage Area
20	Assembly Bay	55	Radio Control Room
21	Building Ways	56	Compressor Sta. No. I
22	Plate Yard	57	Ferry Slip
23	Fitting Dock	58	Engine Inspection Bldg.
24	Railroad	59	General Utility Bldg.
25	Yard General	61	Hull Materials Bldg.
26	Main Pipe Shop		
27	Acetylene Bldg. No. II		
28	Compressor Sta. No. II		
29	Garage		
30	Assembly Bldg.		
31	Service Bldg.		
32	Battery Storage Bldg.		
34	Outfitting Office Bldg.		
35	Joiner Bldg.		
36	Mast & Boom Erection		



CONSTRUCTION NOT STARTED

PILING DRIVEN FOUNDATIONS

UNDER CONSTRUCTION

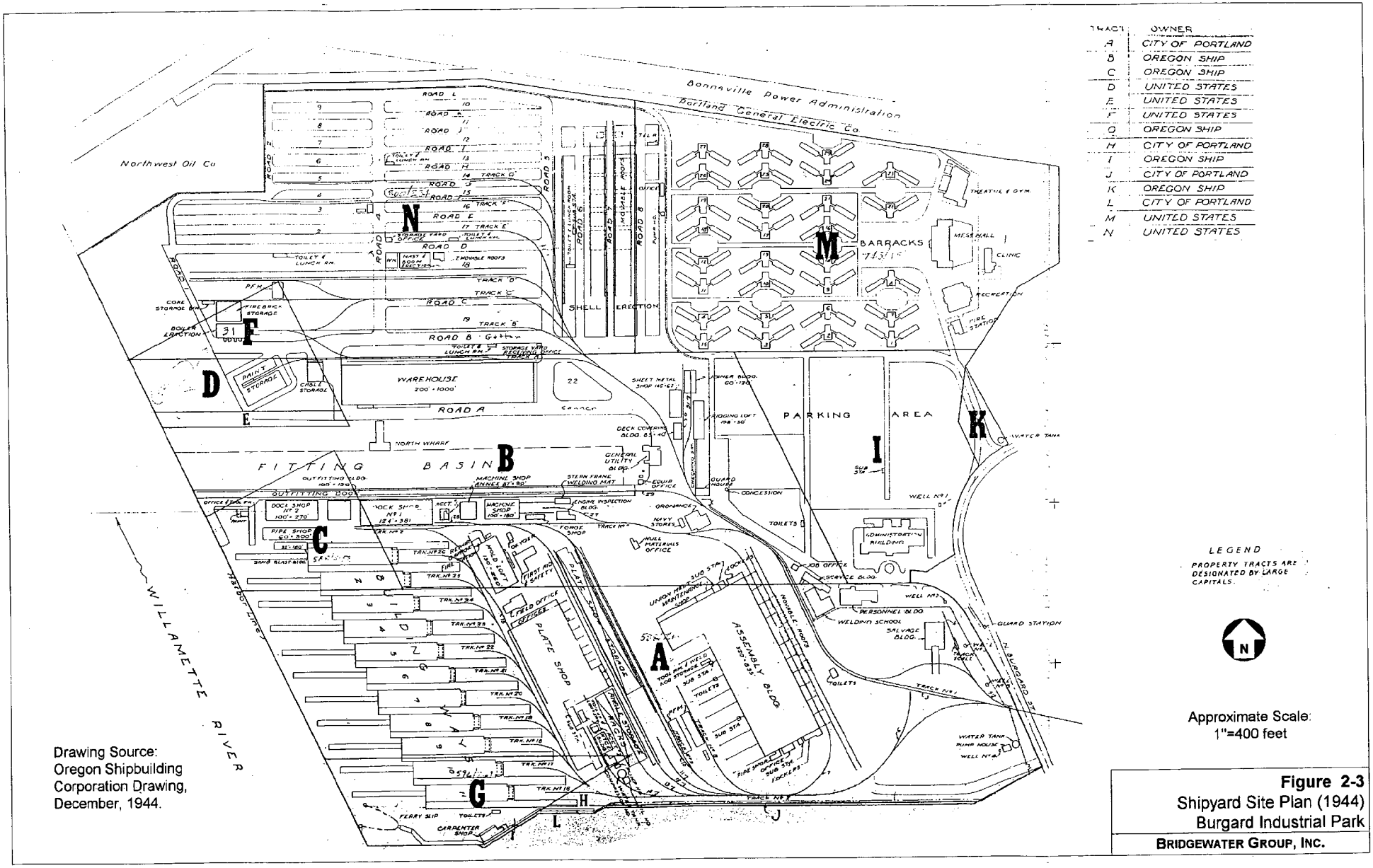
CONSTRUCTION COMPLETED

UNDER RECONSTRUCTION

Drawing Source:
Harding, G.L., "A Survey of Shipyard Operations in the Portland, Oregon Metropolitan Area", February, 1943

Approximate Scale:
1"=400 feet

Figure 2-2
Shipyard Site Plan (1942)
Burgard Industrial Park
BRIDGEWATER GROUP, INC.



Drawing Source:
Oregon Shipbuilding Corporation Drawing, December, 1944.

Approximate Scale:
1"=400 feet

Figure 2-3
Shipyard Site Plan (1944)
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

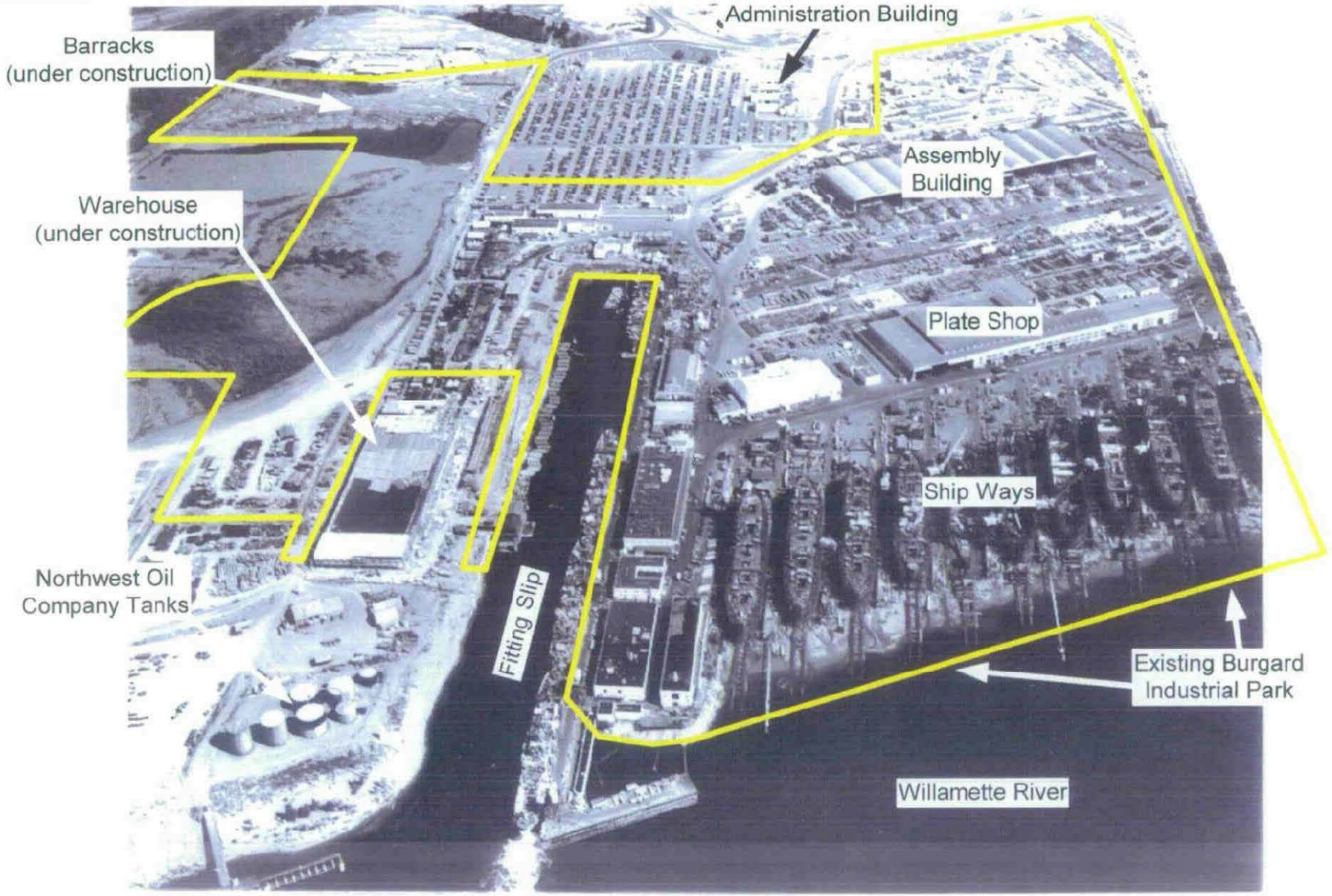


Figure 2-4
1943 Aerial Photograph
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

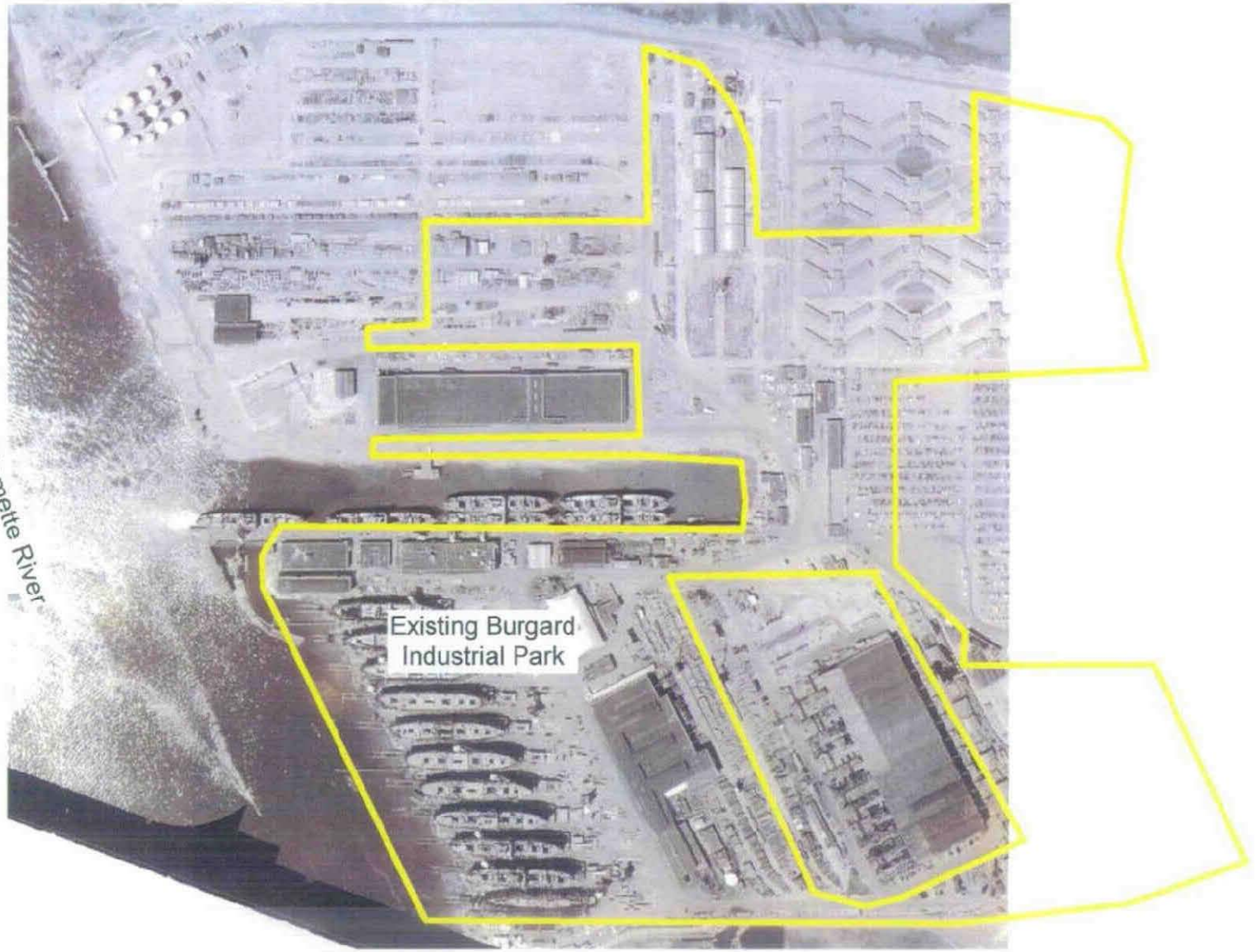


Figure 2-5
1944 Aerial Photograph
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

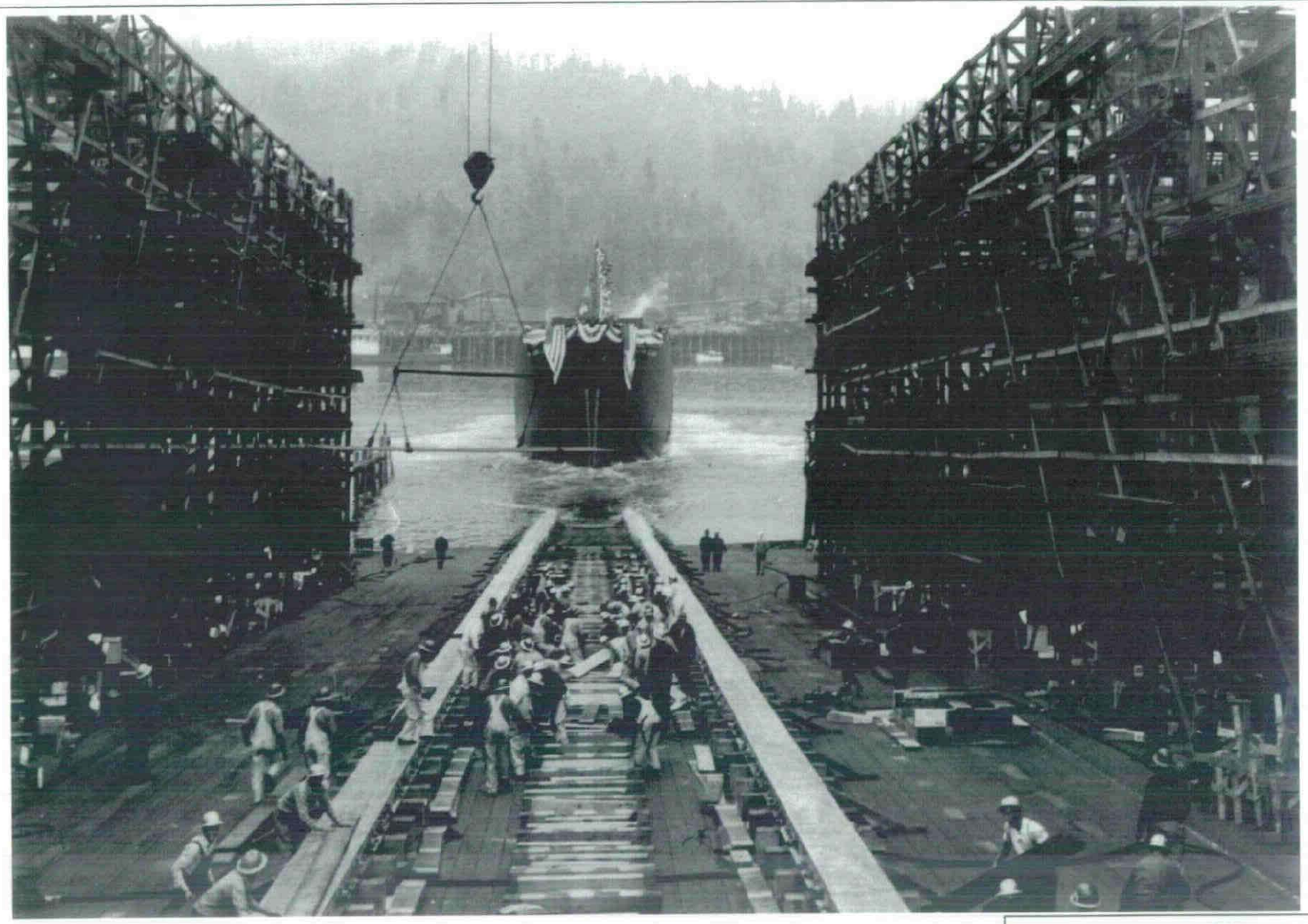
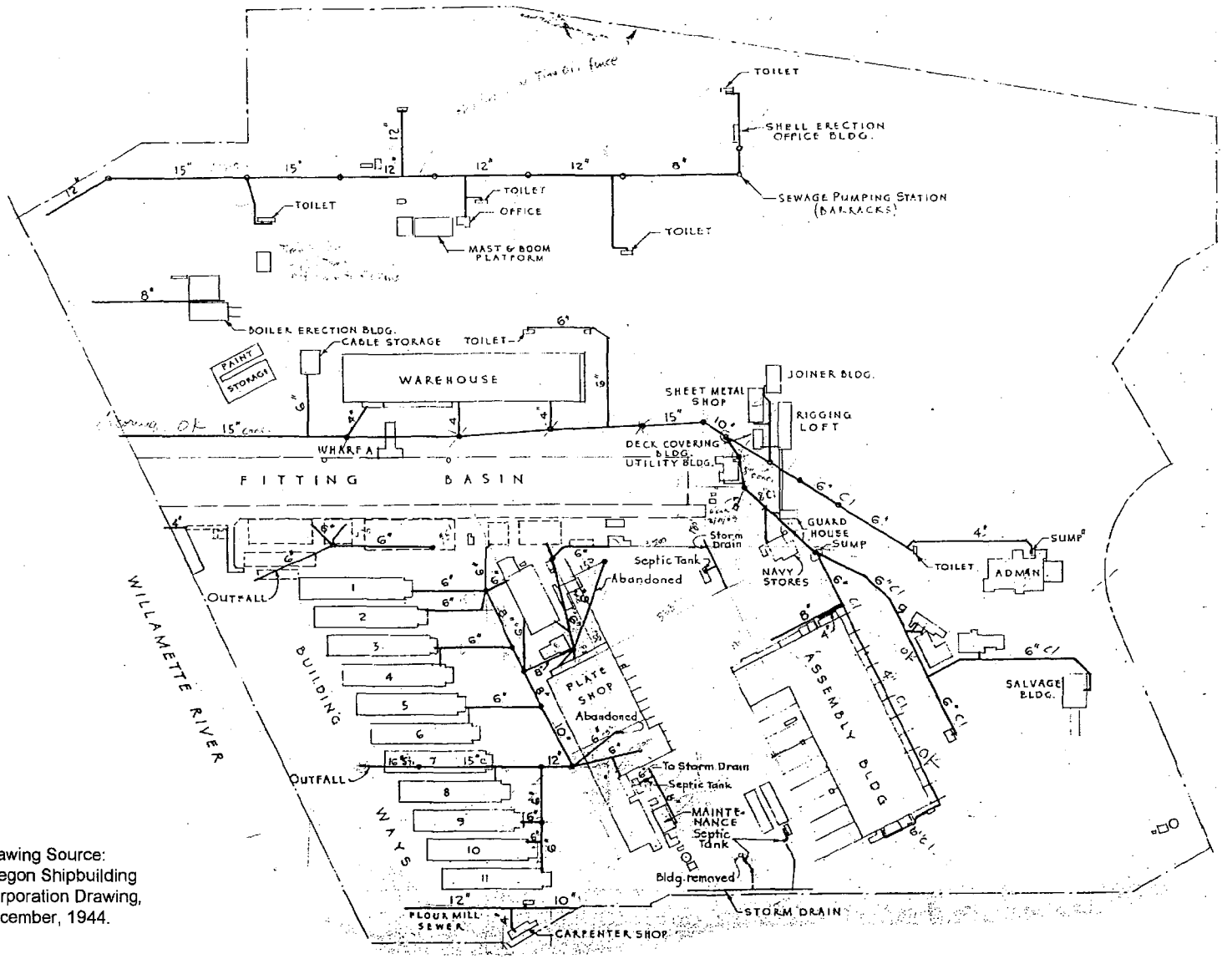


Figure 2-6
Shipyard Shipway (circa 1943)
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

Figure 2-7
OSC Shipyard (circa 1944)
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

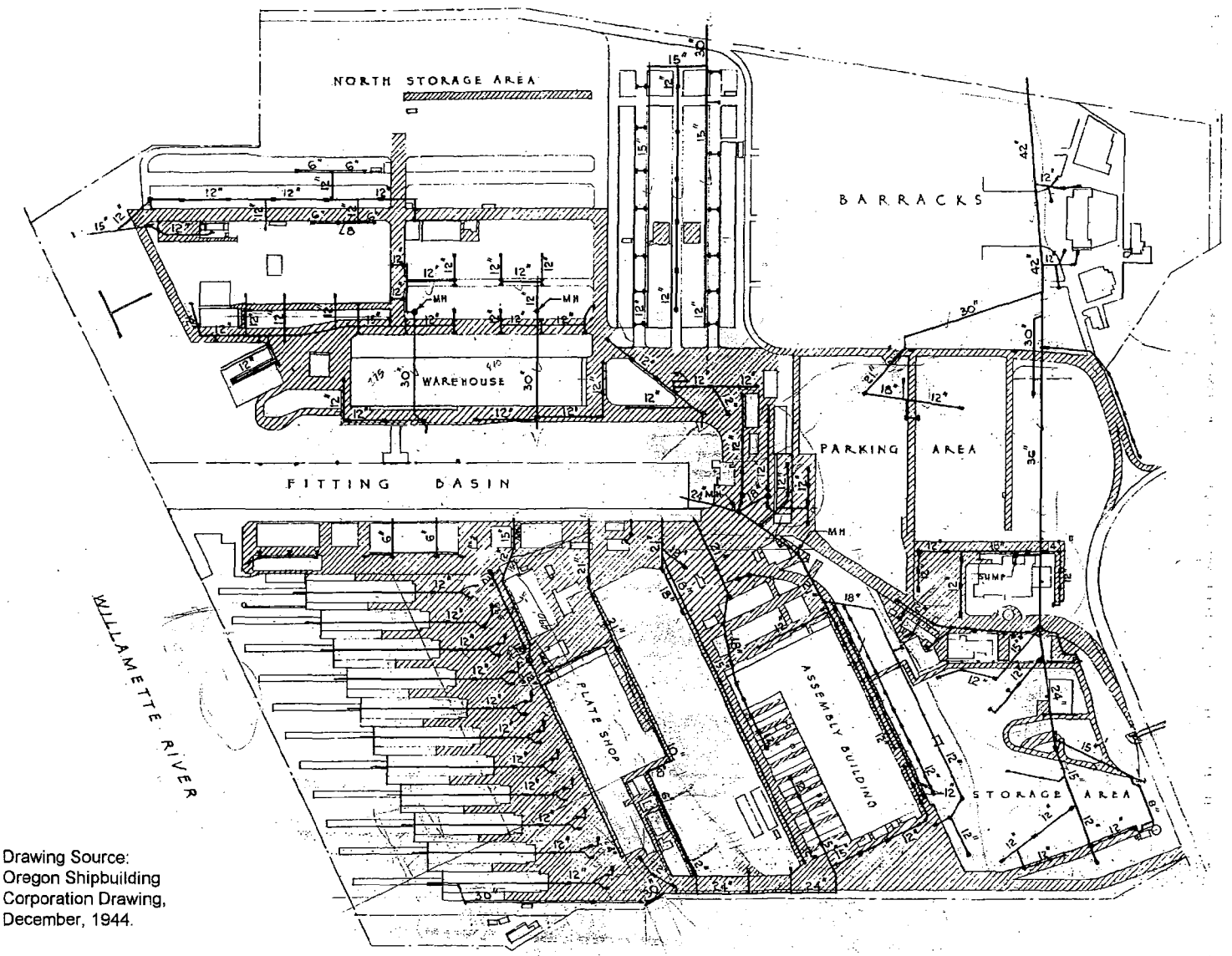


Drawing Source:
Oregon Shipbuilding
Corporation Drawing,
December, 1944.

Approximate Scale:
1"=430 feet

Figure 2-8
Shipyard Sanitary Sewer System
Burgard Industrial Park

BRIDGEWATER GROUP, INC.



Pavement Areas

N

Approximate Scale:
1"=430 feet

Drawing Source:
Oregon Shipbuilding
Corporation Drawing,
December, 1944.

Figure 2-9
Shipyard Pavement and
Stormwater Drainage System
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

N

Approximate Scale

550 Feet

Figure 2-10
Areas of Site During SIC Ownership
Burgard Industrial Park

BRIDGEWATER GROUP, INC.

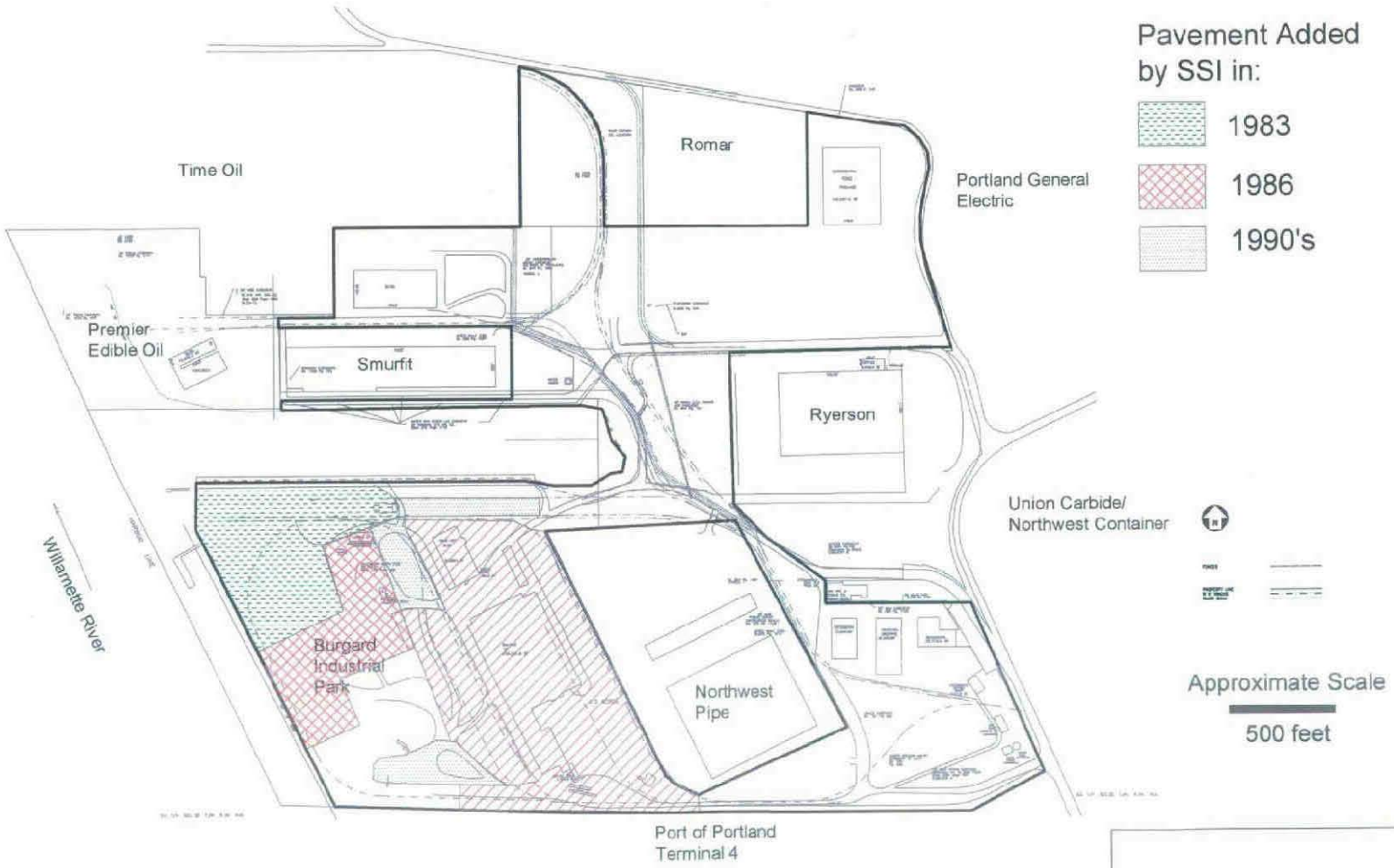


Figure 2-11
SSI Area Pavement
Burgard Industrial Park

Bridgewater Group, Inc.

Figure 3-1
Features of Concern from Site History Review
Burgard Industrial Park

BRIDGEWATER GROUP, INC.